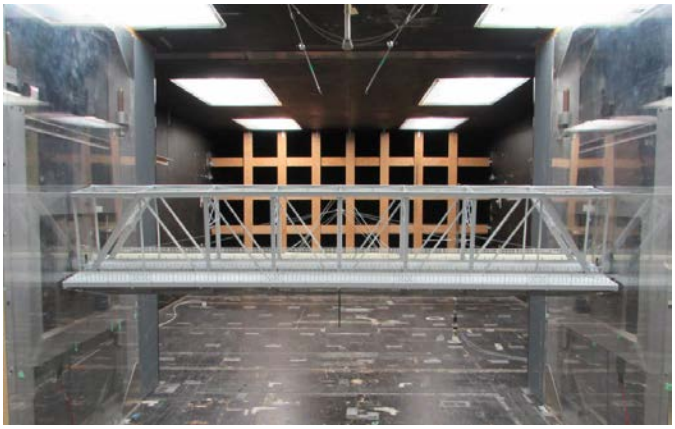
Alexandra Bridge Rehabilitation, Ottawa Ontario

Wind Engineering Study



Client: Dillon Consulting Ltd.	*Year Tested: 2020*	*Length of Total Span: 574.8 m*
Height of Bridge above Water: ~20.8 m	*Deck Width: 18.9 m*	*Section Model Scale: 1 to 40*

The Project

The Alexandra Bridge is a steel truss bridge spanning the Ottawa River, linking the municipalities of Ottawa, Ontario on the south and Gatineau, Quebec to the north. The bridge was originally built between 1898 and 1900. The bridge has an overall length of 563.3 metres with 5 spans. The existing bridge deck has an overall width of 18.9 m, however, is comprised of a central deck of 6.23m, a cantilevered roadway on the east side and a cantilevered pedestrian boardwalk on the west side, each of which are 4.877m in width. The main trusses are situated on either side of the central roadway at 7.315m c/c. The current rehabilitation plan of the bridge includes the following changes: 1) The existing roadway of the east cantilever of the bridge is comprised of a grating system, which may be made solid and become aerodynamically non-porous; 2) Replacement of the Boardwalk Steel Grating from Pier 6 to the Ottawa Abutment, including required repairs, replacement, and strengthening of the support structure to accommodate the new deck system and loading; 3) a structural articulation retrofit, including bearing replacement, stringer/pedestal retrofit at expansion joints, repair and retrofit of bracing members.

The study of wind effects for the Alexandra Bridge was performed at the Boundary Layer Wind Tunnel Laboratory of the University of Western Ontario.

The Wind Tunnel Studies

An analysis of wind data from the Ottawa International Airport was carried out to develop a wind climate modell for the Ottawa region.

The section model was designed and constructed in a way that the trusses can be removed and re-installed for testing of different configurations. The aims of the wind study of the Alexandra Bridge were:

1. Determination of the static force coefficients of the bridge sections;
2. Estimation of the aerodynamic derivatives of the bridge sections;
3. Estimation of the equivalent static wind loads on the bridge sections.

Static tests were performed with the model fixed to a sensitive force balance in order to evaluate the static force coefficients. An evaluation of the aerodynamic derivatives of the section was conducted in smooth flow conditions using the System Identification Approach. Buffeting analysis and analysis of the equivalent static wind loads were carried out through a multimode, coupled 3D buffeting analysis procedure developed at the Laboratory.

The Boundary Layer Wind Tunnel Laboratory

Western

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