Metrolinx Pedestrian Bridge, Pickering Ontario

Wind Engineering Study

Client: AECOM Canada Ltd.	*Year Tested: 2010*	*Length of Total Span: 178 m*
Height of Bridge: 5.4 m	*Deck Width: 7.6 m*	*Section Model Scale: 1 to 25*

The Project

The proposed Metrolinx Pedestrian Bridge is located in the City of Pickering, Ontario, over the 401 Highway and connecting the existing GO Transit station with a new office complex and parking garage near the Pickering Town Centre. The purpose of the bridge is to safely conduct pedestrian traffic over the highway and rail lands. The bridge is an enclosed truss type bridge that also includes a perforated prefinished oval-shaped metal mesh architectural shroud. The bridge is comprised of six main spans, each supported by concrete piers. The T1, T3, T4, T5 and T6 spans have the same overall width (7.6m) and depth (4.9m), but with different span lengths of 42.48m, 43.072m, 38.025m, 33.594m and 20.86m respectively. Span T2 is wider and taller, and has the overall dimensions of 11m (width) × 5.4m (depth) × 23.2m (length). These overall dimensions include the outer shroud.

The study of wind effects for the Metrolinx Pedestrian Bridge in Pickering, Ontario, was performed as a joint study between Theakston Environmental Control and the Boundary Layer Wind Tunnel Laboratory. All tests were performed in the Boundary Layer Wind Tunnel Laboratory of the University of Western Ontario.

An analysis of wind data from both Pearson International Airport and Toronto Island Airport was carried out to develop a wind climate model for the Greater Toronto Area including the City of Pickering.

The Wind Tunnel Studies

The aims of the study were:

1. An evaluation of the prototype screen to establish the pressure loss across the screen material to facilitate the selection of the proper screen for the section model;
2. Basic aerodynamic information for the design of the bridge sections;
3. Determination of the static force coefficients of the bridge sections in smooth wind;
4. Investigation of the overall stability of the bridge sections in smooth wind;
5. Definition of the dynamic behaviour of the bridge sections due to buffeting in turbulent wind;
6. Estimation of the aerodynamic derivatives of the bridge sections;
7. Estimation of the equivalent static wind loads on the bridge sections.

Dynamic tests were performed to assess the responses of the bridge deck in the fundamental modes of vibrations. 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 also carried out for the structure.

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

FSBR/ 77 / April 2020 / LK
Last Printed: April 13, 2020