Prospect Verona Bridge, Maine

Wind Engineering Study

Client: FIGG Bridge Engineers	*Year Tested: 2005*	*Main Span: 1161 ft*
Pylon Height: 430 ft	*Deck Width: 57.5 ft*	*Full Aeroelastic Model Scale: 1:200* *Section Model Scale: 1:70* *Pylon Pressure Model: 1:200*

The Project

The proposed Prospect Verona Bridge is planned as a replacement for the Waldo-Hancock Bridge on US Route 1 between the towns of Prospect and Verona, Maine, over the Penobscot River. The proposed cable stay bridge has a single plane of stays from two pylons supporting a cast-in-place concrete deck. The pylons are about 430 ft high and are of rectangular plan with variable dimensions. They are similar in appearance to the Washington Monument. There will be an observation deck at the top of one of the pylons, which will be accessed by elevator at the base of the pylon. The concrete deck is a closed box 57.5 ft wide and 12.8 ft deep at a maximum elevation of 154 ft above the water. The total length of the bridge is 2120 ft with a main span of 1161 ft. There will possibly be a sidewalk built on the bridge at a future date, placed below one of the “wings” of the deck.

A wind climate study was carried out for the Prospect Verona Bridge. The design probability distribution of surface wind speed and direction was developed on the basis of full scale meteorological records from nearby weather stations. Monte Carlo simulations of the tropical storms were also carried out to assess their impact on extreme winds expected to affect the Prospect Verona Bridge.

The Wind Tunnel Studies

A primary objective of the section model study was to investigate the overall aeroelastic stability in high wind conditions and to define the wind speeds associated with possible flutter instability and vortex shedding induced oscillation. The investigation also was intended to define the dynamic response characteristics of the section to turbulent wind over a full range of wind speed and to provide information for the design of the structure against wind effects. Since the Prospect Pylon includes a multi storey observation area with glass curtain walls, a pressure model study was conducted to obtain the wind cladding loads on this portion of the pylon. The pressure study was also used to provide measurements of the pedestrian level wind speeds at the Prospect Pylon entrance area and to provide predictions of wind speeds expected at the site, which were then compared with acceptance criteria for pedestrian comfort and safety. The bridge aeroelastic model was designed and constructed to determine the response characteristics of the bridge to three-dimensional turbulent flow in wind conditions characteristic of the site winds. Two configurations of the bridge were studied in the aeroelastic model investigation. These included the completed bridge and the double cantilevered construction stage.

The Boundary Layer Wind Tunnel Laboratory

Western

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