The Bronx-Whitestone Bridge, NY, USA

Wind Engineering Study

Owner The Triborough Bridge and Tunnel Authority, New York, NY, USA	*Engineers* Weidlinger Associates, Inc. New York, NY, USA	*Year Tested* 1999
Length 3770 feet	*Main Span* 2300 feet	*Shipping Clearance* 135 feet
Tower Height 367 feet	*Suspension Cable Diameter* 21 inches	*Deck Width* 74 feet

The Project

The Bronx-Whitestone Bridge, New York is a vital link in the transportation network of New York City. Opened to traffic in 1939, the bridge has undergone a number of structural modifications, including the addition of a stiffening truss atop the main girders and a tuned-mass damper located at midspan. Both of these modifications were attempts to raise the critical wind speed for flutter, which, for the original bridge was approximately 50 mph.

The bridge is undergoing a deck replacement and aerodynamic treatment of the stiffening girder system. Aerodynamic model tests were a vital component of the bridge rehabilitation process.

The Wind Tunnel Studies

The Boundary Layer Wind Tunnel Laboratory has been involved in aerodynamic investigations of the bridge since the early 1970's and has performed the following experimental investigations:

The Wind Tunnel Studies (cont'd)

- 1 to 60 scale section model of the deck and 1 to 400 scale taut strip model of the main span, used in the design of the tuned mass damper system.
- 1 to 60 scale section model of the deck for the orthotropic deck replacement. This model was the test-bed for the evaluation of a number of aerodynamic enhancement schemes.
- 1 to 250 scale full aeroelastic model of the entire bridge. The full model was tested with the proposed orthotropic deck replacement and revised section properties. Different values of structural damping were used for the model to simulate the effects of the tuned mass damper. Tests were performed in turbulent boundary layer flow, in order to model the wind conditions at the site.

A full scale monitoring programme was undertaken to better understand the behaviour of this long span bridge in wind and to compare the results to wind tunnel studies.

The Boundary Layer Wind Tunnel Laboratory

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