Cheat River Bridge, Tucker County, WV

Wind Engineering Study

Clients: T.Y. Lin International Inc.	*Year Tested: 2023*	*Overall Bridge Span Length: 3300 ft*
Main Span Length: 620 ft	*Deck Width: 88.5 ft*	*Deck Section Model Scale: 1 to 50*

The Project

The proposed Cheat River bridge is a 10-span, 3300 ft long composite steel girder bridge, with a 620 ft main span that crosses the Cheat River near Parsons, West Virginia. The deck width is 88.5 ft wide and provides for four traffic lanes. The deck consists of two continuous deck Units which have an expansion joint at Pier 5: Unit 1 spans Piers 1 to 5, while Unit 2 spans Piers 5 to 9 and includes the critical 620 ft Span 8. Piers 1-7 and Pier 9 have a staggered I-beam cross-section, while Pier 8 consists of three circular columns.

The section models of the Cheat River Bridge deck, including the basic deck section as well as two types of potential fairings, were studied at the Boundary Layer Wind Tunnel Laboratory of the University of Western Ontario.

The Wind Tunnel Studies

The design wind speeds for the Cheat River Bridge for analysis of wind loads and aerodynamic stability were calculated based on AASHTO specifications.

The Wind Tunnel Studies (Cont.)

The primary objectives of the section model study of the Cheat River Bridge were to investigate the aeroelastic stability characteristics of the bridge deck in high wind conditions and to define the wind speeds associated with possible flutter (or galloping) instability and / or vortex shedding induced oscillation, for the deck section with and without fairings. An aim of the wind tunnel investigation was also to define the dynamic response characteristics of the bridge deck to turbulent wind over a full range of wind speed.

Analytical estimates of the critical wind speeds for flutter (or galloping) and the responses of the bridge to turbulent buffeting, with the basic deck section, were carried out using a 3-D multimode analysis, which integrates the findings of the experimental study with the dynamic modes and frequencies of the bridge. Another major output of this analytical study is the equivalent static wind loads, which are used to verify and improve the wind load distributions used for design of the bridge.

The Boundary Layer Wind Tunnel Laboratory

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