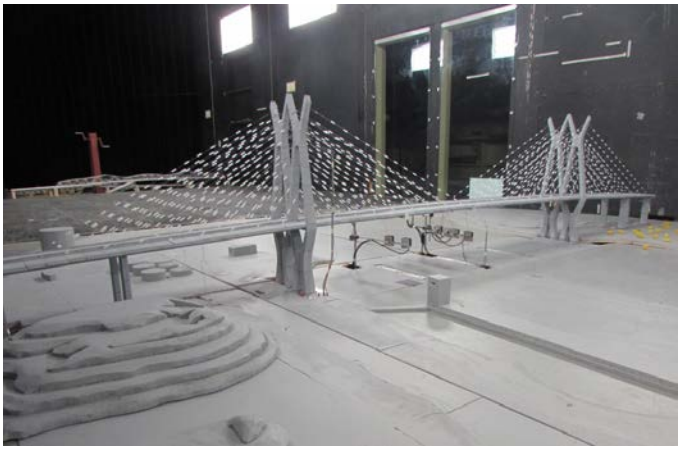
The Houston Ship Channel Bridge, Houston, Texas

Wind Engineering Study



Clients: Figg Bridge Engineers and COWI North America	*Year Tested: 2016 ~ 2020*	*Length of Bridge Span: 2720 ft* *Length of Main Span: 1320 ft*
Tower Heights: ~ 540 ft	*Deck Width: 81.75 ft*	*Full Bridge Aeroelastic Model Scale: 1:200* *Deck Section Model Scale: 1:60*

The Project

The Houston Ship Channel Bridge includes a major crossing of this busy waterway. It is a core component of the Sam Houston Parkway / Tollway, Beltway 8, in Houston, Texas. The new bridge will replace the existing bridge multi-span concrete box girder bridge, which will be demolished following completion of the Southbound (SB) span of the new cable-stayed bridge. Following the demolition of the existing bridge, the Northbound (NB) span of the new bridge will be erected in approximately the same footprint. The new bridge consists of a 2720 ft concrete segmental deck bridge with spans of 240'-460'-1320'-460'-240' (side span – back span – main span – back span – side span). Upon completion, the new bridge will consist of two independent 81.75' wide decks separated by a gap of approximately 9.5'. The decks are concrete trapezoidal boxes with a depth of approximately 12.3' at the center. The edges of the decks have an aerodynamically-shaped rounded edge. The pylons are 'double-diamond shaped, with two inclined members at the edges of each deck which are connected both above and below the roadway. The two inside-edge members are also connected at approximately the 515' level. Each pylon is also connected at deck level through a deep cross-beam to the bridge decks. Since the two decks share the central pylon member, dynamic motions of one deck will be structurally coupled to the adjacent deck through the cable and pylon system. 16 pairs of cables support each span of the bridge

The Wind Tunnel Studies

The wind study of the Houston Ship Channel Bridge includes wind climate analysis, full aeroelastic model test, section model test and Equivalent Static Load analysis. A primary objective of the section model study was to investigate the overall aerodynamic stability of the deck section in high wind conditions and define the wind speeds associated with possible flutter instability and vortex shedding induced oscillation within the design criteria for wind. The investigation also served the purpose to define the dynamic response characteristics of the section to turbulent wind and to provide information for the design of the overall structure against wind effects.

A primary objective of the full aeroelastic model study was to investigate the behaviour of the bridge under low turbulence conditions as well as the overall aerodynamic stability in high wind conditions. The definition of the wind speeds associated with possible flutter instability and vortex shedding induced oscillation of the structure was also a primary objective. The investigation was intended to determine the response characteristics to three-dimensional turbulent wind in expected site wind conditions over a full range of wind speeds.

The Boundary Layer Wind Tunnel Laboratory

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