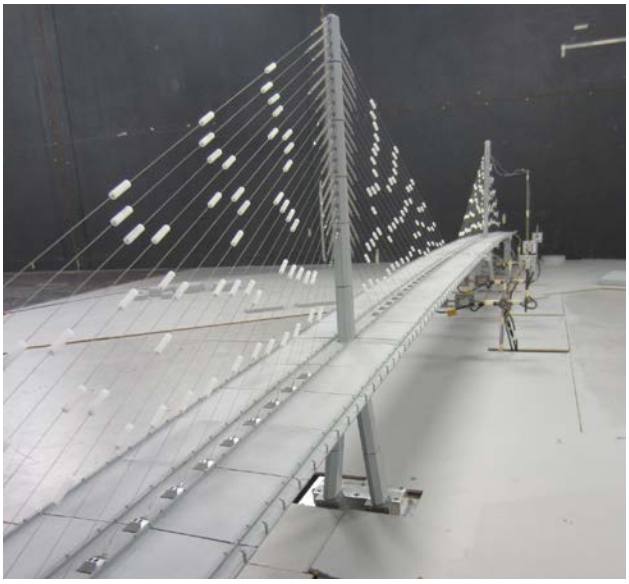
The Harbor Bridge, Corpus Christi, Texas

Wind Engineering Study



Clients: Figg Bridge Engineers and Ove Arup & Partners Ltd	*Year Tested: 2016 ~ 2021*	*Length of Bridge Span: 3289 ft* *Length of Main Span: 1661 ft*
Tower Heights: ~ 540 ft	*Deck Width: 149 ft*	*Full Bridge Aeroelastic Model Scale: 1:250* *Deck Section Model Scale: 1:70* *Pylon Section Model Scale: 1:48* *Cable Section Model Scale: 1:2.48*

The Project

The new Harbor Bridge in Corpus Christi, Texas, consists of a 3289 ft concrete segmental deck cable-stayed bridge, with spans 814'-1661'-814. Upon completion, the bridge will consist of two concrete boxes connected by transverse delta-frames, resulting in an overall deck width of approximately 149 ft. The minimum vertical clearance is 205 ft over the central portion of the navigation channel. The deck is slightly asymmetric about the cable anchorages, due to the presence of a 10 ft wide shared-use pathway on the northbound side of the bridge. There is a Belvedere (scenic lookout) accessible by the shared use pathway on the northbound side of the bridge at the mid-span of the Main Span. The cable stays are in a double cable arrangement, with 19 pairs of cables on each of the back spans, and 38 pairs of cables on the main span. The pylons are a uniform 16 ft wide in the transverse direction and taper in the longitudinal direction from 38 ft at the foundation level to 14 ft at the top of each pylon, with an overall height of about 540 ft. The new bridge will be constructed at a distance of more than 1000 ft from the existing Harbor Bridge.

The Wind Tunnel Studies

The wind study of the Harbor Bridge includes wind climate analysis, full aeroelastic model, section model and Equivalent Static Loads. A primary objective of the section model study was to investigate the overall aerodynamic stability in high wind conditions and define the wind speeds associated with possible galloping, 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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