Indian River Inlet Bridge, Delaware

Wind Engineering Study

Client: FIGG Bridge Engineers	*Year Tested: 2004*	*Main Span: 1000 ft*
Arch Crown Height: 274 ft *Deck Height: 55 ft*	*Deck Width: 108.5 ft*	*Full Aeroelastic Model Scale: 1:150* *Section Model Scale: 1:80* *Arch Section Model: 1:40*

The Project

The proposed Indian River Inlet bridge is a tied-arch bridge with a 1000 ft main span and two side spans of 150 ft. A 23 ft deep arch with a single plane of suspenders supports the 108'-6" wide deck. The deck sections are composed of precast concrete sections with traffic barrier, rounded nosing on one side and a cantilevered sidewalk on the other.

A wind climate study was carried out for the Indian River Inlet 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 Indian River Inlet Bridge.

The Wind Tunnel Studies

A primary objective of the section model study for the deck section was to investigate the overall aeroelastic stability 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 over a full range of wind speed and to provide information for the design of the overall structure against wind effects. The main purpose of the section model study for the arch section was to investigate the extent of the Reynolds number dependency in consideration of its curved surface. The bridge aeroelastic model was designed and constructed to determine the response characteristics of the bridge to three dimensional turbulent flow in simulated site wind conditions, over a full range of wind speeds. Four bridge configurations, including the completed bridge and three under construction stages, were studied in the aeroelastic model investigation.

The Boundary Layer Wind Tunnel Laboratory

Western

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