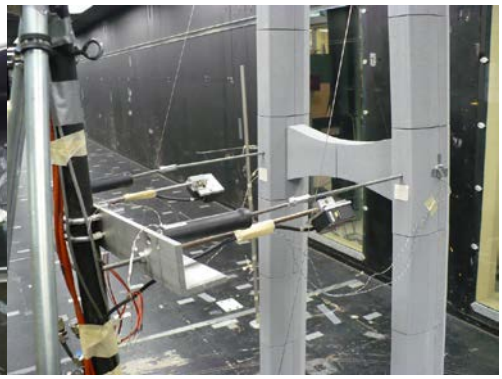
The Straits of Messina Bridge (Tower), Italy

Wind Engineering Study

Tower Top



Tower Mid-section with Dampers

Messina Tower Test Set-up

Client: COWI A/S, Denmark	*Year Tested: 2011*	*Main Span: 3300 m*
Tower Height: 399 m	*Deck Width: 60 m*	*Full Aeroelastic Tower Model Scale: 1:200*

The Project

The proposed bridge is located between the island of Sicily and Reggio Calabria on the mainland. The bridge will feature a six-lane highway, two service lanes and a double-track railway. It is a steel suspension bridge with a central span of 3,300 m between the two towers and two side spans of different lengths and arrangements, for an additional 960 m to the Sicily anchorage and 810 m to the Reggio Calabria anchorage. The steel towers, standing at a height of 399 m to the cable saddles, each consist of two vertical legs linked by three cross beams. The deck has a total width of about 60 m and comprises a central double-track railway deck flanked on either side by a 3-lane road deck. The suspension system consists of two pair of steel cables, each with a diameter of 120 cm. The deck is suspended from the cables by a system of vertical steel hangers at 30 m intervals.

The wind tunnel tests were performed in the Boundary Layer Wind Tunnel Laboratory at the University of Western Ontario.

The Wind Tunnel Studies

The primary focus of the investigation was to provide verification of the tower behavior. A full aeroelastic model of the tower was designed and constructed at a geometric scale of 1 to 200. The full aeroelastic model was designed as a non-Froude scaled model, in order to utilize a greater range of the wind speed of the wind tunnel and to increase the Reynolds number associated with vortex shedding induced oscillation to as high a value as practical. As a precaution against mis-interpreting the results of the non-Froude scaled model tests, a second model was designed and constructed using Froude number scaling. The identical geometric scale of 1 to 200 was utilized and the models were tested in a similar fashion. The primary difference in the model tests was the model to prototype wind speed scaling, which in the case of the non-Froude scaled model was approximately 1 to 6 and for the Froude scaled model was 1 to 14.1.

The full tower model tests included the measurement of the response of the full aeroelastic model to turbulent wind for two configurations: 1) Completed Tower, free standing condition; 2) Completed Tower, pinned at top simulating the effects of the main cables and tie back.

The Boundary Layer Wind Tunnel Laboratory

Western

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