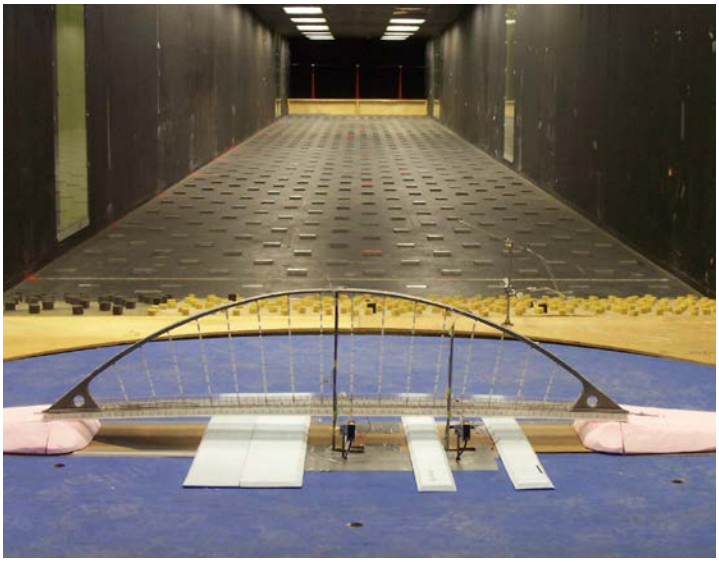
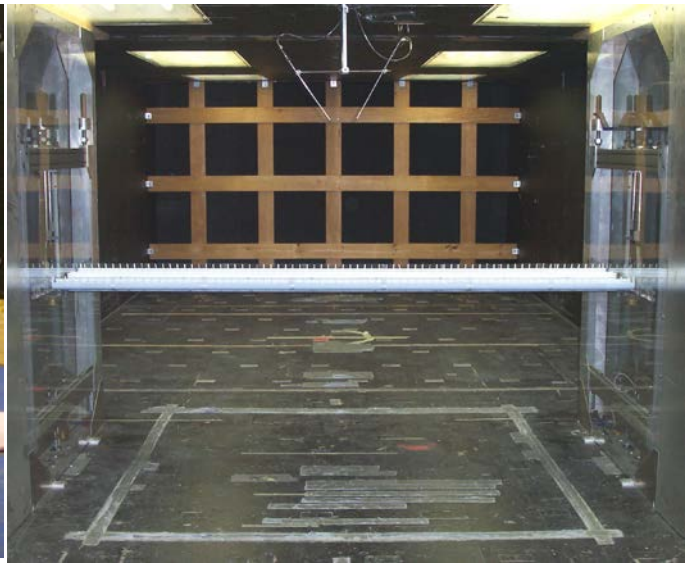
The Reggio Emilia Bridge, Italy

Wind Engineering Study





Client Santiago Calatrava Valls S/A.	*Engineer* Santiago Calatrava Valls S/A	*Year Tested* 2004
Length of Superstructure 221 metres	*Main Span Lengths* 1 span at 221 metres	*Deck Elevation* Approximately 10 metres
Arch Height 46 metres above deck	*Deck Depth* 3.82 metres total	*Deck Width* 25.6 metres

The Project

The Reggio Emilia Bridge carries traffic over a highway in Reggio Emilia, Italy. The structure is a 221m long main span bridge, with a central arch with two planes of suspenders supporting a 25.6m wide deck. The deck sections are comprised of a central trapezoidal structural element (to which the cables are attached) and cantilevered roadways with sidewalks and a curved pedestrian edge barrier. The aim of the study was to provide estimates of wind-induced loads to facilitate the structural design and to ensure aerodynamic stability of the completed structure

The Wind Tunnel Studies

A wind climate study was carried out for the Reggio Emilia Bridge. The design probability distribution of surface wind speed and direction was developed on the basis of full scale meteorological records from a nearby station at Rolo, about 28 km away from the bridge.

The Wind Tunnel Studies (cont'd)

The 1:60 scale section model was tested using a static force balance in which the overall static forces and moment in vertical, lateral and torsional directions were measured at different angles of vertical wind inclination; and again with scaled dynamic structural properties of the prototype, to monitor its dynamic response. The section model was tested in smooth flow as well as grid generated turbulent wind representative of the natural wind at the project site.

The full bridge aeroelastic model was constructed at a geometric scale of 1:150 relative to the prototype. And tested in three dimensional turbulent boundary layer flow. Two typical upstream terrain conditions were used in the tests, namely, an open country exposure and a suburban exposure. Measurements were taken at 10° intervals for wind angles from 0° to 180° for both exposures. Flutter instability was not experienced for winds up to 55 m/s at deck height, nor was any vortex shedding induced deck or arch vibration observed.

The Boundary Layer Wind Tunnel Laboratory

Western

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FSBR/ 23 / April 2009 / PK
Last Printed: April 30, 2009