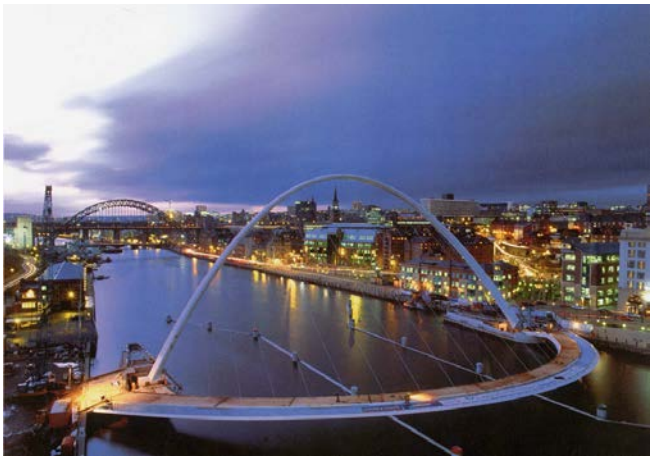
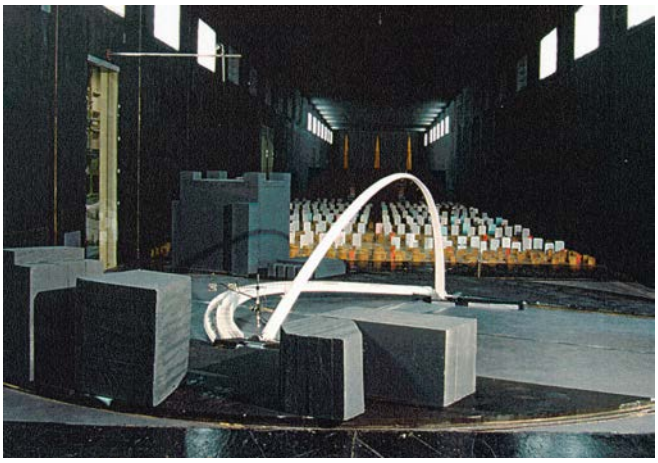
The Baltic Millennium Footbridge, Gateshead, UK

Wind Engineering Study





Owner: The City of Gateshead, UK

Engineers Gifford and Partners	*Architects* Chris Wilkinson Architects	*Year Tested* 1998
Main Span 105 metres	*Clearance (in closed condition)* 4.6 metres	*Shipping Clearance (in open condition)* 25 metres
Arch Height 45 metres	*Stay Cable Diameter* 45 mm	*Deck Width (varies)* 7.38 to 8.88 metres

The Project

The Baltic Millennium Footbridge, between Gateshead and Newcastle over the River Tyne in the UK, is a unique structure, with a span of 105 metres. The cable stiffened steel arch footbridge is part of a redevelopment project on both sides of the river. The structure incorporates aerodynamically shaped deck with a footpath and cycleway in a horizontal curve, which rotates along with the arch and cable system through a system of hydraulic rams at the arch springing to allow shipping traffic to pass beneath the bridge.

The prime objectives of the wind tunnel studies were to demonstrate the safety of the structure under various stages of operation, both with respect to aerodynamic stability as well as the effects of common wind speeds. Pedestrian comfort was an important objective in the study. The definition of an envelope of wind speeds for safe operating conditions for the arch opening was a prime concern.

The Wind Tunnel Studies

- A statistical investigation of the wind climate.
- 1 to 50 scale full aeroelastic model of the entire bridge. The full model was tested in different stages of arch opening in turbulent boundary layer flow, complete with the local topography and surrounding buildings in order to model the variable wind conditions at the site.
- 9 angles of arch opening and 5 angles of wind azimuth were investigated.
- The pedestrian in-service case of the closed arch showed no evidence of vortex shedding induced oscillations.
- The model tests identified critical stages of operation that enabled the definition of the forces at various locations in the structure.

The bridge was tested to site wind conditions of up to 49 m/s in the closed condition and 33 m/s in the open condition with no aeroelastic instabilities.

The Boundary Layer Wind Tunnel Laboratory

Western

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FSBR/ 05 / July 2000 / PK
Last Printed: July 5, 2007