

Neath River Bridge Wind Shielding, Wales



The 1.2 km long elevated viaduct, a combination of concrete and steel/concrete composite construction, forms part of the M4 Motorway and is the major arterial link in South Wales. Opened in 1996, the high-level crossing of the Neath River has been closed on many occasions due to high winds affecting the safe transit of vehicles. A study was undertaken by Flint & Neill Limited to evaluate the feasibility of installing wind shielding along the bridge in order to protect the traffic from the effects of high winds.

The effectiveness of the barriers was tested using conventional experimental wind tunnel studies, conducted at BMT's Teddington wind tunnel facilities, as well as incorporating innovative Computational Fluid Dynamics analysis, carried out in parallel at the University of Cambridge. This unique approach utilised the complementary strengths of each technique for the study of wind to provide a flexible and economical basis for the study.

Initial tests were carried out using CFD analyses to understand the airflow characteristic across the bridge deck through a variety of different barriers. Using these results, a series of wind tunnel tests were conducted to verify the findings of the CFD analyses and to provide data on vehicle over-turning, three dimensional effects and free-stream turbulence. Further refinement of the barriers was undertaken in a subsequent set of CFD analysis, providing an optimised solution.

The drivers for the selection of wind barriers were a balance between the improvement of the wind environment across the deck, the cost (including strengthening) and the effect on the aesthetic quality of the bridge. The barriers chosen reduced the risk of the wind hazard to traffic to the same level as the surrounding motorway network, while not requiring any major strengthening of the bridge. This was achieved by the use of a 3.3 metre high barrier with vertical slots providing 50% porosity.

Computer imagery techniques were employed to demonstrate the benign effect of the barriers on the appearance of the structure and to highlight the positive effect of vertical barriers over horizontal barriers on the user experience of crossing the bridge.

