The Tsing Ma Bridge, Hong Kong

Wind Engineering Study

Design: Mott MacDonald, Ltd., Hong Kong

Owner The Highways Department of the Government of Hong Kong, SAR, People's Republic of China	*Contractor* Kvaerner Cleveland Bridge, Ltd. Darlington, U.K.	*Year Tested* 1993 & 1997
Length 2.2 kilometres	*Main Span* 1377 metres	*Shipping Clearance* 62 metres
Tower Height 206 metres	*Suspension Cable Diameter* 1.1 metres	*Deck Width* 41 metres

The Project

The Tsing Ma Bridge, Hong Kong is the longest combined road and rail bridge in the world with a main span of 1377 metres. The bridge is located approximately 25 km west of Hong Kong Island and forms part of the route to the new airport on Lantau Island. It is located in an area of the world that experiences typhoon strength winds almost every year.

The prime objectives of the wind tunnel studies were to demonstrate the safety of the structure under construction and once completed, both with respect to aerodynamic stability as well as the possible effects of extreme typhoon wind speeds. A further objective was to provide dynamic response data at several key locations to compare with full scale data from the ongoing monitoring programme, conducted by the Highways Department of Hong Kong.

The Wind Tunnel Studies

A Monte-Carlo simulation of the typhoon wind climate was performed.

A 1 to 80 scale section model of the deck in the erection stage was tested.

Studies were based on 1 to 400 scale full aeroelastic model of the entire bridge. The full model was tested in different stages of construction in turbulent boundary layer flow, complete with the local topography in order to model the wind conditions at the site.

The model tests identified critical stages of erection that allowed the construction schedule of the bridge to be tailored to avoid the typhoon season.

The comparison of model test results and the full scale monitoring will assist engineers to better understand the behaviour of long span bridges in wind and to improve current design methods.

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Western

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