

Aerodynamic Behaviour of Very Long Cable-Stayed Bridges during Construction

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Summary

Two new cable-stayed bridges have pushed the world record for the span length of cable-stayed bridges to over 1000m. The design of these bridges, both located in typhoon prone regions, is strongly influenced by wind effects during their erection. Rigorous wind tunnel test programmes have been devised and executed to determine the aerodynamic behaviour of the structures in the most critical erection conditions. Testing was augmented by analytical and numerical analyses to verify the safety of the structures throughout construction and to ensure that no serviceability problems will affect the erection process. This paper outlines the structural and aerodynamic properties of the structures and discusses similarities as well as interesting differences.

Keywords: Cable-stayed Bridges, Construction, Buffeting, Wind Tunnel Measurements, Cables

1. Introduction

Two new cable-stayed bridges in China have surpassed the current world record in main span length by breaking into the realm of over 1000m span. Sutong Bridge sets the new record at 1088m span with Stonecutters Bridge following at 1018m. Sutong Bridge, which is the key element of a large river crossing, features a conventional layout with A-shaped towers and an all-steel superstructure with regular backspans. Stonecutters Bridge, located in the urban area of Hong Kong and hence subject to geometrical constraints, has very short backspans made of concrete to balance the long steel main span. It further features a twin-box grillage deck and single pole towers, which give it a rather unusual structural arrangement. The configurations are depicted in Figs. 1 to 3.

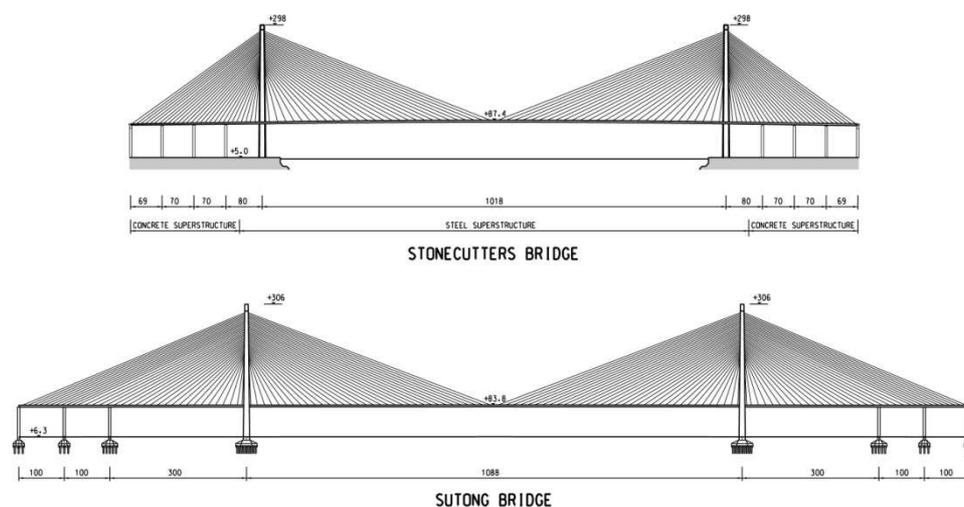


Fig. 1: General arrangement of bridges