

Aerodynamic challenge and limitation in long-span cable-supported bridges

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ABSTRACT

As one of the most formidable challenges on long-span cable-supported bridges, recent advances in wind engineering studies have been presented in the aspects of flutter instability, torsional divergence and stay cable vibration. Successful aerodynamic stabilization for long-span suspension bridges is reviewed, which is followed by current studies of several super long suspension bridges with a main span from 1680m in the 2nd Humen Bridge to 2016m in Sunda Strat Bridge. It seems that the intrinsic limit of span length due to aerodynamic stability is about 1,500m for a traditional suspension bridge, but slotted box deck could provide a 5,000m span length as the aerodynamic limit to a suspension bridge with high enough critical flutter and torsional speed. Since long-span cable-stayed bridge intrinsically has quite good aerodynamic stability based on close-box deck and spatial cables, rain-wind induced vibration and mitigation are discussed as a main aerodynamic challenge. In order to reveal the aerodynamic limit span length two super long cable-stayed bridges, with single 1400m span and double 1500m spans in Qiongzhou Strait Bridge, have been experimentally investigated through sectional and full models in flutter and torsional instability.

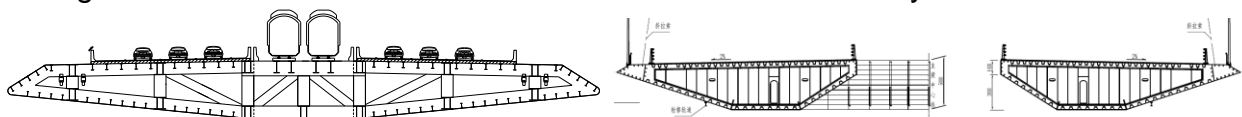


Fig. 1 Sunda Strait Suspension Bridge



Fig. 2 Qiongzhou Strait Cable-stayed Bridge

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