ShiZiYang Bridge – Large diameter main cables

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Abstract

The ShiZiYang suspension bridge in the GuangDong province in China will when constructed have a world record main span of 2180 m and carry an impressive 2 x 8 lanes of traffic on the two levels truss girder.

Due to its size, ShiZiYang bridge requires extensive main cable area with diameter nearly 1.5 m representing the largest main cable ever constructed. An option of dual main cables can be considered with smaller main cables including simpler compaction. However the construction time is extended, all adjacent structures such as saddles, anchorages and cable clamps become significantly more complex and the separate cables behave as independent members.

The paper discusses the main key challenges regarding design and construction of large main cables with diameter above 1m and alternatively dual main cables.

Keywords: ShiZiYang bridge; suspension bridge; main cable; high strength cable steel; single main cable; dual cables; cable system erection; cable system structures

1 Introduction

The technological development is pushing the boundaries of span lengths of suspension bridges together with the increasing deck weights carried by the main cables. ShiZiYang bridge in GuangDong province in China is a bright example with the planned main span of 2180 m carrying 2 x 8 lanes of traffic on 2 level truss girder deck. A rendering of the bridge is displayed in Figure 1-1.

Due to the length of the span and the considerable deck weight, the main cable diameter will be significantly bigger in comparison to the current record breaking longest span suspension bridge, Canakkale bridge (Turkey, 2023 m main span, maximum main cable diameter 0,881 m) that has opened to traffic March 2022. The largest ever constructed main cable diameter measures 1,3 m and is applied on the WuFengShan Yangtze River Bridge (road and railway combined with a main span of 1092m) in China. In comparison, the main cable of ShiZiYang bridge is expected to slightly exceed 1,4 m in diameter.

There are several challenges connected to the main cable with size beyond the constructed bridges related to both, design and construction. An option to avoid the main cables of such significant size is to split the single cable into a dual cable which has been previously used in Verrazzano-Narrows Bridge (USA) as the longest span suspension bridge with the dual main cable.

The present paper describes the main design aspects for main cables, discusses use of high strength cable steel, compares the design of main cable system with single and dual cables and identifies possible construction related issues.

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