Tianxingzhou bridge: world record span for railway cable-stayed bridges

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Summary

The Tianxingzhou bridge, 4657 m long, includes the world record span for railway cable-stayed bridges, with 504 m.

Its combined road-rail deck required sophisticated dynamic analysis under train loving loads. Earthquake, fire, and stay cables vibrations were also investigated in detail.

Keywords: Stay cables, steel structure, dynamic analysis, high speed train.

1. Description of the bridge

The Tianxingzhou bridge is located in Wuhan, province of Hubei, in China. It allows the crossing of Yangtze river by a highway and four railway tracks. Its total length is 4657 m for the railway viaduct. The roadway viaduct length included in the contract is only 2639 m. The bridge includes a north access viaduct, 2956 m long, a central cable-stayed bridge, 1092 m long, and a south access viaduct, 609 m long.

The bridge has two levels: a 2x3 lanes highway at the upper level, and 2 freight tracks and 2 high speed tracks at the bottom level.

The access viaducts are made from cast-in-place prestressed concrete box-girders, with a 40.70 m typical span. The railway decks are made from simple spans, with two 3.58 m deep box-girders. The highway decks are made from continuous spans, with two 2.40 m deep box-girders, and are supported on concrete frames. The concrete piers are founded on 19 bored piles, 1.50 m diameter.

The north access viaduct includes a special railway bridge, built by balanced cantilever, with variable depth deck, with the following spans: 54.2 - 80 - 80 - 54.2 m. The concrete piers are founded on 12 bored piles, 2.50 m diameter.

The cable-stayed bridge has 5 spans: 98 - 196 - 504 - 196 - 98 m (fig. 1). The deck is a Howe type steel truss, 31 m wide and 17 m deep, comprising three main longitudinal truss girders, suspended to three planes of stay cables (fig. 2).

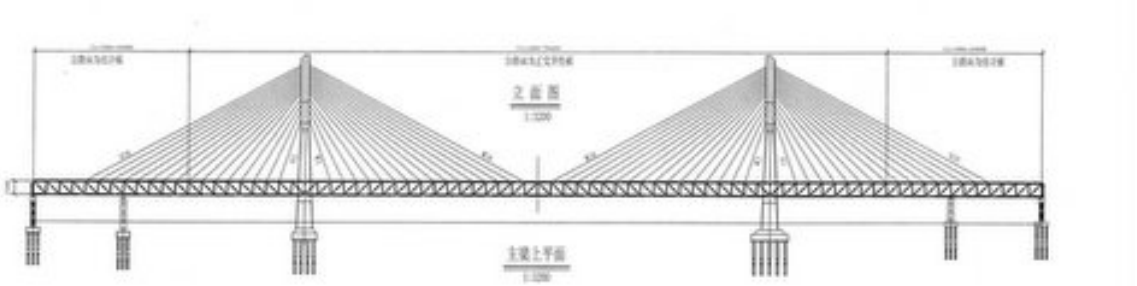

Fig. 1: Cable-stayed bridge elevation

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