

Overall Design of the Nanjing Jiangxinzhou Yangtze River Bridge

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Abstract: This paper systematically introduces the overall design concept of the Nanjing Jiangxinzhou Yangtze River Bridge. The main bridge is a three-tower cable-stayed bridge featuring a longitudinal diamond cable tower and dual central cable planes. The bridge span is designed to be a total of $80+218+600+600+218+80 = 1796\text{m}$. A steel-shell composite cable tower design is adopted, with the main girder including a high-performance steel-coarse aggregate reactive powder concrete (CA-RPC) composite girder structure. The cable tower uses cast-in-situ bored pile group foundations, and the stay cables are formed of steel strands. The south and north approach bridges use segmented prefabricated prestressed concrete box girders. The bridge over the river dyke uses a continuous box girder made of prestressed corrugated steel webs for the 78m span and the construction technology of segmented prefabrication has been used for the first time. Nanjing Jiangxinzhou Yangtze River Bridge has become a classic engineering structure which not only environmentally-friendly, but also meets all requirements of industrial construction attributed to the application of a high-performance composite structure for the main bridge, as well as large-scale prefabricated assembly structures for approach bridges and bridges over river dykes.

Key words: Nanjing Jiangxinzhou Yangtze River Bridge; steel shell-concrete composite cable tower; CA-RPC; segmented girder bridge made of corrugated steel webs through prefabricated assembly; industrial construction

1 Overview of Nanjing Jiangxinzhou Yangtze River Bridge Project

Nanjing is one of the four ancient capitals of China, also the economic center and transportation hub of East China. The Yangtze River runs through the city and becomes a natural moat cutting off the city. Nanjing Jiangxinzhou Yangtze River Bridge is in the center of the city and connecting the two banks of the Yangtze River. The bridge improves the regional road networks, greatly alleviates the difficulty of crossing river transportation, and promotes the integrated development of the city on both banks.

Route of this project starts from Wuli Bridge in Pukou District of Nanjing, connects with the reconstructed Jiangbei Avenue, crosses the main channel of Yangtze River, passes through Meizhou, dives down the south bank of Jiajiang River and connects with the completed Jiangshan Avenue. The total length is 10.334 km, including 4134m Yangtze River main channel bridge, 1754.6m Jiajiang tunnel and about 4.4km other sections. This paper mainly introduces the design of the main channel bridge across the Yangtze River.

2 Main Design Standards

- Highway class: First-class two-way six-lane highway
- Class of vehicle load: Class-I Highway
- Design speed: 100 km/h
- Bridge structural design baseline period: 100 years
- Basic design wind speed: 31.7 m/s
- Basic seismic intensity: Zone VII

3 Design of Main Bridge

3.1 Bridge Span Arrangement

The bridge site finds at the main river surface of the Yangtze River, with 3km in width and of busy shipping. Considering the factors such as navigation, flood control, investment and aesthetics, Nanjing Jiangxinzhou Yangtze River Bridge adopts the cable-stayed bridge with three towers and double main spans ($80+218+2\times 600+218+80$)m over the Yangtze River. The two 600m main spans effectively cover the area with a water depth of 10.5m, fully adapting to the shipping development and the requirement for multi-line navigation.