

Ship Impact Protection System of Sutong Yangtze River Bridge

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Summary

Not far from the estuary, Sutong Yangtze River Bridge is located in the Jiangsu Province of China, the main bridge is a 7-span continuous cable stayed bridge, with the span arrangement of 100+100+300+1088+300+100+100 m. The foundations are cast-in-situ bored piles. One of the critical loads in the design of foundations is ship impact force. According to the actual situation of Sutong Bridge, researches were carried out for the collision between ship and foundations, base on the researches comparison was carried out between floating collision protection system and self-resistant protection system which self-resistant system were proved to be the preferred proposal. The self-resistant system make use of steel cofferdam of casting of pile cap, the thickness of tremie concrete was adjusted according to navigation water level and dimension of typical ships. As part of the collision protection system, introduction was made for the vessel navigation system (VTS).

Keywords: cable-stayed bridge; bored piles; foundation; ship impact; self-resistant.

1. Introduction

Sutong Yangtze River Highway Bridge (hereon will be mentioned as Sutong Bridge) is located in the Nantong section of Yangtze River, south east of Jiangsu Province in China, 108 km from the estuary. Connecting Suzhou City (south side) and Nantong City (north side), it is the latest and largest one in the 5 Yangtze River crossing projects planned for Jiangsu Province in the 1990s.

The span arrangement of Sutong Bridge is 100+100+300+1088+300+100+100 m, a 7-span continuous cable stayed bridge, with the largest mid span of cable-stayed bridges in the world, shown in Fig. 1.

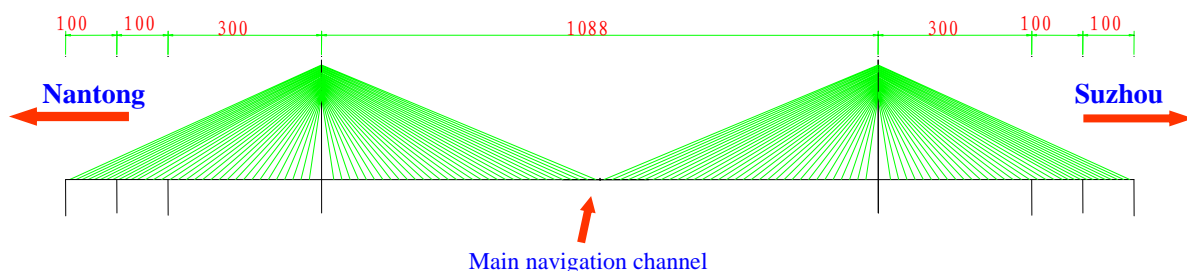


Fig. 1 Bridge span arrangement (Unit: cm)

As the 'golden channel' of China, the navigation requirement of Yangtze River is very high. According to the special study the typical ship for the main navigation channel is: 50,000 tone DWT container (3800TEU) and 48,000 ton DWT bulk cargo barge fleet.

The main characteristic of geological situation of the site is: the bedrock is deep embedded to -300 m, which is not feasible to act as the resistant layer for the foundations, the bottom of layer Q₄ is -60 m, and -130 m for Q₃ layer, mainly consist of clay & sand. The Geological profile of Pier No. 4 (North Pylons) is shown in Fig. 2 as the typical geological situation..