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# The main cable shape control and design of Sanchaji Bridge

**Abstract：** This paper is intended to give a brief introduction on the structural design essentials and construction method of Sanchaji Bridge, a self-anchored suspension bridge with steel box girder (span contribution: 70+132+328+132+70m) located in Changsha, Hunan Province, China. Sanchaji Bridge distinguishes itself from other self-anchored suspension bridges in construction by having its hangers installed through jacking the steel box girder from the middle span of the bridge. In this way, the hangers stretching are no longer a necessary procedure. The segmental catenary method is adopted to calculate the cable shape in all phases and the unstressed length of the main cable of the bridge.

**Key word:** steel box girder；self-anchored suspension bridge；segmental catenary

## 1．Introduction

As a public transportation pivotal construction of the Second Ring Road of Changsha City, Sanchaji Bridge is located in the lower reaches of Xiangjiang River. Given the specific geological condition and the terrain, as well as the requirement of navigation, the self-anchored suspension bridge plan was selected over many other plans. Its layout is shown by Fig.1:

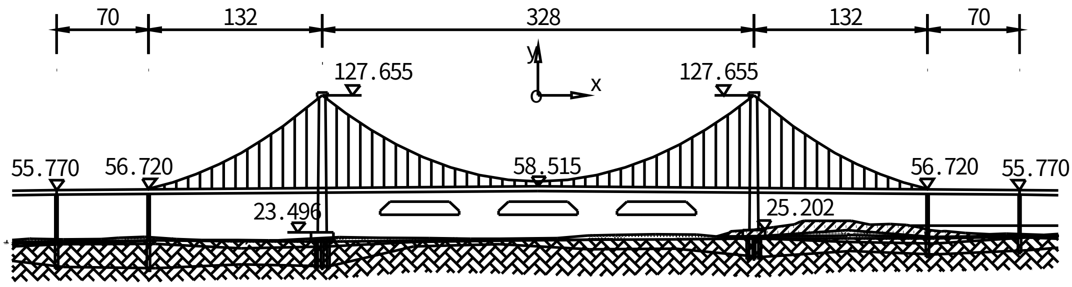


*Fig. 1 Figure of Sanchaji Bridge*

## 2. Structural Design Essentials

### 2.1 Structural System

The bridge spans are contributed as (70+132+328+132+70) m, which are symmetrically arranged. The rise-span ratio of the mid span is 1/5, which of the side span is 1/10.6245. The shape of the stiffening girder is a curve with the radius of 24402.745m. The systematic features of the structure are as follows:

（1）Considering the features of self-anchored suspension bridge and the navigation requirement of Xiangjiang River, we adopt a continuous beam as the steel box beam of this self-anchored suspension bridge. In this way, the huge upward force imposed by the main cable on the anchorage area can be eliminated and no negative reaction is expected on the bearings under the dead load.

（2）The main beam of the bridge is a compression-bend combined member, and its stability is of great importance. To make sure that the negative reaction is not produced on the bearings under either dead load or live load, we place precast concrete blocks in the main beam at the top of piers.

（3）The constraint bearing state can exert great influence on the reaction of the structure. A hydraulic MSTU anti-seismic damper is longitudinally installed between the main beam and the pylon. In this way, the stiffening girder becomes a longitudinal floating system under temperature action, while it is longitudinally restricted between the two cable pylons under dynamic load, such as the seismic action and the vehicle braking force, thus to reduce the force act on the foundation of each single pylon.

https://doi.org/10.2749/weimar.2007.0527
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