# Recent Development and Challenges of Long-Span Railway Cable-Stayed Bridges in China

**Hui Guo**[1, 2]

[1]*Railway Engineering Research Institute, China Academy of Railway Sciences Corporation Limited, Beijing, China*

[2]*State Key Laboratory for Track Technology of High-speed Railway, Beijing, China*

**Contact:** superhugo@163.com

## Abstract

The main span of railway cable-stayed bridge in China has broken through from 312m in 2000 to 1092m in 2020, with rapid development in recent years. It comes from aspects of new material, new structural form, accelerated bridge construction method, and innovated construction facilities and equipment. New materials mainly include bridge structural steel with higher yield strength, stay cable with higher tensile strength and ultra-high-performance concrete (UHPC), etc. New structural forms refer to three-main truss with three-cable plane, cable-stayed bridge with ballastless track system, multi-pylon railway cable-stayed bridge, etc. Concept of accelerated bridge construction has been also applied in caisson construction, truss girder assembling, truss girder hoisting, etc. Several new facilities and equipment have also been created such as integral bridge expansion joint, hoisting crane, and smart torque wrench, and so on. Challenges have also been discussed.

**Keywords:** railway cable-stayed bridge; new material; structural system; structural devices; bridge expansion joint; hoisting crane; torque wrench; technological challenges.

## 1 Introduction

Rapid development has been witnessed in construction of railway cable-stayed bridges in China since completion of Wuhu Yangtze River Bridge with main span of 312m in 2000, within only 20 years [1]. In aspects of material, structural system, construction and equipment, those bridges can be regarded as the milestone such as Wuhan Tianxingzhou Bridge, Tongling Bridge, Husutong Bridge, etc. with main span of 504m, 630m, 1092m, respectively [2]. Now, Changtai Bridge and Maanshan Bridge are under construction, with main span 1176m and 2×1120m, representing a breakthrough of much longer span.

Major innovations have been summarized for railway cable-stayed bridges in China in 21st Century. And main challenges of railway cable-stayed bridges have also been discussed.

## 2 New material

New material such as bridge structural steel, high performance stayed cable, and UHPC supports the construction of railway cable-stayed bridge with main span over 1000 meters.

### 2.1 Bridge structural steel

From 1950s, bridge structural steel had been consecutively studied in China to meet the development requirements of railway steel bridges, with different bridge types besides cable-stayed bridge. A3q steel (Q235) was early used in Wuhan Yangtze River Bridge built in 1957 with yield strength of 235MPa and rivet joint. The main span

https://doi.org/10.2749/nanjing.2022.0338
Distributed by structurae