

Construction technology innovation of Sunk Shaft foundation and composite tower of 1200m highway and railway cable-stayed bridge

Yongtao Zhang

e-mail: 18183001@qq.com

CCCC Second Harbor Engineering Company LTD;

CCCC Highway Bridge National Engineering Research Centre Co. Ltd

Wuhan, China

Yonghui Li

e-mail: 2391357233@qq.com

CCCC Second Harbor Engineering Company LTD;

Research and Development Center of Transport Industry of Intelligent Manufacturing Technologies of Transport Infrastructure

Wuhan, China

Ming Chen

e-mail: cm_shcc@qq.com

CCCC Second Harbor Engineering Company LTD;

Key Laboratory of Large-span Bridge Construction Technology

Wuhan, China

Chengming Peng

e-mail: 93344725@qq.com

CCCC Second Harbor Engineering Company LTD;

CCCC Highway Bridge National Engineering Research Centre Co. Ltd

Wuhan, China

ABSTRACT

The Changtai Yangtze River Bridge is an impressive feat of engineering, boasting the world's largest span cable-stayed bridge with a main span of 1176 meters. The foundation of the cable tower adopted a sunk shaft foundation with a structure size of 95.4×58.2×64m. The tower is 352m high, the middle and lower towers are spatial diamond type four-tower limb concrete towers, and the upper tower is steel-core concrete composite tower. Innovative technologies were utilized during the bridge's construction, including an automated air-lift soil extraction equipment and cluster control system, along with a three-dimensional panoramic rapid imaging technology for efficient and visualized soil extraction and sinking of the sinkhole. Additionally, an intelligent auxiliary decision-making algorithm and control system were developed for digital sinking. The steel reinforcement of the tower adopts the block-based reinforced bar product construction process, and develops the intelligent production line and equipment for component steel reinforcement to achieve high precision, high efficiency and unmanned production of steel components. The tower's concrete construction utilized a new intelligent hydraulic climbing system, which integrated automatic concrete pouring, intelligent maintenance, and synchronous climbing systems, improving quality and safety. The research and development of the W12000-450 intelligent tower crane was also crucial to the bridge's construction, capable of lifting up to 450 tons with a lifting width of 75 meters, including active anti-collision, wire rope wear self-test, and frequency conversion rotation functions. Overall, the implementation of these innovative technologies has made the Changtai Yangtze River Bridge a landmark achievement in modern engineering.

Keywords: Cable-stayed bridges, sunk shaft foundation, composite tower, reinforced bar product, construction control.