Design & Construction of WanZhou Yangtze River Railway Bridge

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Summary

The main bridge of Wanzhou Yangtze River Railway Bridge is a (168+360+168)m tied arch bridge with continuous steel truss, adopting self-balanced structural system; that is the push force tranfered from arch rib will be balanced by pull force of tied bar, no exterior push force exists. The suspenders adopt “H” shaped steel members, and anti-vibration holes setting of suspenders can prevent wind vibration. The anti-corrosion coating system for steel structure adopts fluorin-carbon dope as the finishing coat. The brdige structural type and anti-corrosion coating system are first adopted in China.The side span was installed by semi-cantilever method supported on temporary pier, while the mid span adopted balanced-cantilever method using sling tower frame, the bridge was closed at midspan.

Key words: tied arch bridge with continuous steel truss; structural design; wind Anti-vibration; sliding hinge bearing; anti-corrosion coating system; steel truss installation

1. Introduction

Wanzhou Yangtze River Railway Bridge is located in Wanzhou District of Chongqing, due to special topography, geotechnical and navigation condition, the main bridge adopted (168+360+168)m tied arch brdge with continuous steel truss. This bridge construction was commenced in December, 2002, and was completed in December, 2005. This bridge, of which structural type is adopted first in China, is the major railway bridge completed with the biggest span in China, being also the biggest railway arch bridge in the world.

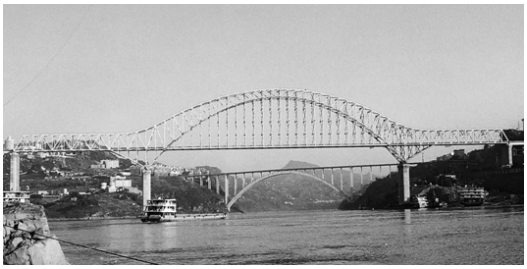

Fig. 1: Photograph of Main Bridge

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2. General Arrangement

Wanzhou Yangtze River Railway Bridge is 1106.3m long, with main bridge of 696m length, adopting (168+360+168)m tied arch brdg with continuous steel truss; the approach bridge is PC continuous box beam.

3. Main girder

The (168+360+168) m tied arch bridge with continuous steel truss has a self-balanced mechanical system; that is the push force of arch rib is balanced by tie-bar. The railway bridge deck adopts orthotropic girder system; both cross girder and longitudinal girder have "I" shape section. The bracing system is arranged crosswise, adopting welded "H" shape members.

The suspenders adopts welding "H" shape section, some anti-vibration holes are set on web and wing plate of suspenders to restrain the wind-vibration. The anti-vibration holes are rectangular with arch fillet; the opening rate of web is 35%, while that of wing plate is 31%.

A new sliding hinge bearing is adopted, as the longidudinal displacement system of movable bearing, the roller is replaced by sliding plate.

4. Anti-corrosion Coating for Steel Girder

Wanzhou is located in the area where heavy acid rain always occurs. Based on science research and a series of tests, the component of anti-corrosion coat system for this bridge is as below:

Special epoxy zinc rich primer:	Minimum dry film thickness is 2×40μm
MIO epoxy intermediate coating:	Minimum dry film thickness is 2×40μm
Fluorine-carbon finishing coat:	Minimum dry film thickness is 2×35μm

The above coating system is used for major railway steel bridge first in China. Now it is applied widely in Chinese railway steel bridges.

5. Steel Girder Installation

The end span is erected by semi-cantilever method supported by trestles and temporary piers. The middle span is installed by symmetric full cantilever method by using buckle sling tower. The sling tower is assembled by "H" shape members and universal rods; its foot is connected to upper chord nodes at mid pier through hinges. The closure steps of mid span are that the tie-bar is closed after truss arch closure.

Fig.2: Photograph of Steel Girder Installation

6. Conclusion

In the recent tens of years, arch bridges of steel truss are rarely applied in the world. While in China, this classical bridge type combining modern bridge construction technology is used widely. The design and construction of Wanzhou Yangtze River Railway Bridge will provide valuable experience for those projects, and create firm foundations for application of the similar bridge type.