

Innovative Technologies for Construction of the Pingnan Third Bridge

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Abstract

The main bridge of the Pingnan Third Bridge is a half-through concrete-filled steel tubular (CFST) arch bridge with a world-largest effective span of 560 m. Due to the significant breakthrough in span and the adverse environmental features of construction site, many technological difficulties were encountered in construction of the Pingnan Third Bridge. Accordingly, systematic innovative technologies on design, construction, material and management of large-span CFST arch bridges were proposed, and fairly remarkable technological and economic benefits were achieved in this bridge. Meanwhile, considering the proposed technologies have solved several key general bottlenecks of extra-large arch bridges, especially CFST arch bridges, the technologies can also be good references for other similar bridges in the future.

Keywords: the Pingnan Third Bridge; CFST arch bridges; innovative technologies; design; construction; material; management.

1 Introduction

The main bridge of the Pingnan Third Bridge is a half-through concrete-filled steel tubular (CFST) arch bridge with an effective span of 560 m. The bridge ranks first in the world in the main span length. It started construction on August 7, 2018, and was completed on December 28, 2020.



Figure 1. Photo of the completed Pingnan Third Bridge

2 Design and construction

2.1 The background

The main span of the bridge was supposed to exceed 500 m according to the local conditions. Among the proposed bridge types, the construction cost of a CFST arch bridge was estimated to be 16% and 6% lower while the stiffness was 6 times and 1.5 times higher than a suspension bridge and a cable-stayed bridge. Moreover, an annual maintenance cost over RMB one million yuan would be saved. Thus, a CFST arch bridge was finally selected.

2.2 Bridge design

The main arch of the bridge is composed of two parallel arch ribs, with the effective span, rise-span ratio and arch axis coefficient being 560 meters, 1/4 and 1.5. A four-tube truss section is adopted for each rib, with the radial height at the arch foot section, the radial height at mid-span section and