Long-span Steel Truss Arch Bridge Construction and Innovation

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Abstract

The new bridge under construction in Zhuhai, China, is a dominant project of Jinding-Gaolan road, which is the vital communication line throughout Zhuhai. The superstructure of main bridge is 100m + 400m + 100m steel truss tied-arch bridge. The bridge is assembled symmetrically from side span to middle span. Except for 1# segment and 2# segment of side span assembled by truck crane, all the other truss segments are assembled by 80t girder erection crane using cantilever erection method. Cable-stayed system is adopted to help mid-span arch erection and ensure safety during the whole process. After arch closure, rigid tie bar segments of mid-span can be erected by deck derrick crane. Instead of temporary flexibility tie bar, temporary locked bearing has been invented to resistant horizontal force at arch springer during rigid tie bar construction, so as to satisfy navigation requirement of first grade waterway at worksite.

Keywords: tied-arch bridge; cantilever erection; cable-stayed system; longitudinal locked bearing.

1 Bridge description

The main bridge in Zhuhai over Hongwan waterway is a steel truss tied-arch bridge with a span distribution of 100-400-100. The rise of arch is 90m and the bridge deck is 36m wide for bi-direction six-lane traffic.

The depth of arch ring ranges from 11m to 46.68m between side pier and middle pier, and then reduces to 7m at arch crown. The truss arch segments are assembled by integral joints, the biggest of which weighs up to 110t. The "H" shaped edge stringer over navigable span, also known as rigid tie bar, is connected to the arch by 27 couples of suspender. The steel strand flexible tie bar, passing through rigid tie bar, is anchored between arch-beam junction joints E9 and E9'. The bridge floor system consists of "工" shaped longitudinal beams and cross beams , with an upper concrete slab 0.26m thick connected to longitudinal beams and cross beams by PBL. Asphalt paves on concrete slab after bridge completed. Over 1100m^3 concrete is used for each "Π"shaped side pier, which embeds north/south side arch joints above north/south side piers, so as to reduce balance weight of side span.

Q420qD steel and Q345qD steel are adopted for the arch members manufacturer. 1670Mpa parallel wire strand and 1860Mpa steel strand are adopted for suspenders and flexible tie bar separately. C60 concrete is adopted for "Π" shaped side pier.

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