

Key Technology for the Design of a Cable-Stayed Bridge in a High-Intensity Area

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Abstract

The background project is Xiyan Bridge, Pingcheng Street, Datong city, Shanxi Province. The bridge crosses both railway marshalling yards and multiple important railway lines. The span arrangement is (41+50+163) m. The overall design, key structure design and calculation of the main bridge are introduced in detail for high intensity areas and for large spans with width and bidirectional asymmetric main girders. The main point is placed on the comparison, selection and analysis of the main tower as an all-steel structure and steel-concrete composite structure for its seismic system design. The linear control, weighing and counterweight scheme are simulated for the main construction process of the whole bridge without setting up the closing section of a rotating body on site. The calculation proves that the structure design is reasonable and that the construction is safe and reliable. It can provide a reference for the design and construction of similar bridges.

Keywords: bidirectional asymmetry structure; hybrid beam cable-stayed bridge; seismic system design; weighing and counterweight; rotation construction.

1 Background project and introduction

The project is located on the west extension line of Pingcheng Street, north of the ancient city of Datong city, Shanxi Province. This line crosses the existing railway marshalling yards and several important railway lines. It is planned as the main urban road with a width of a 50 m red line. Pingcheng Street Road is an east–west street, and the main line viaduct starts from Wuzhouxiyi Road in the west and crosses Wuzhou Road, the Planning Road, the railway marshalling yard (approximately 340 m wide), Xihuan Road and the Yunzhong Road tunnel, ending approximately 150 m west of Weidu Avenue with a total length of approximately 1716 m. To facilitate rapid access to the long-term planning of the West Ring expressway, the planning

scheme considered in the west of the west ring road set up two ramps linked with the main line of Pingcheng Street, the near ramp access to the ground of the West Ring Road, through local reconstruction, into the West Ring elevated expressway main line in the long future to achieve rapid interconnection of Pingcheng Street and the West Ring expressway. The engineering plane location is shown in Figure 1.



Figure 1. Geographical location of the background project