



## Partial cable-stayed bridge in the application of heavy haul railway

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### Abstract

Taking the partial cable-stayed bridge with main span of 248 meters which used on the railway coal corridor from western Inner Mongolia to central China as an example. the adaptability and particularity of partial cable-stayed bridge in the span range are analyzed based on structural static analysis theory. Pylon and girder rigid fixity, pier and beam separation system is applied, H-shaped bridge towers, the double cell concrete box girder and the monofilament epoxy coating prestress strand is used in this bridge. The results indicate that stay-cables contribution to the overall stiffness value of 33%. In order to improve the structure performance of the controlling area such as cross section, bridge tower adopt the high tower type system, depth-span ratio is determined to be 1/4.35, C60 high performance concrete is applied. The main pier bearing adopts double 190000 kN large tonnage steel spherical bearings because of the heavy dead loads and the heavy live loads, using the high-performance materials and Partial sealing technique to ensure the bearing durability, stability and long service life. The structure of the bridge meets the requirements of heavy haul railway according to the analysis.

**Keywords:** Partially cable-stayed bridge; Heavy haul railway; Restraint system; Large tonnage support; Secondary internal forces; Stiffness of tower

### 1 Summary

All kinds of bridge types have different application scope for span. The prestressed concrete continuous beam has the characteristics of large self weight. When applied to railway bridges, the main span is generally within the range of 128m. As a kind of continuous beam cable stiffening structure, the partial cable-stayed bridge can extend its span, and the span range is from 140m to 280m. It has the advantages of providing greater spanning capacity and effectively controlling late deformation compared with the continuous beam; while compared with the conventional cable-stayed bridge, it also has many

advantages, such as saving engineering quantity, large structural stiffness and short construction period. Therefore, it has been widely used in high-speed railway, intercity railway and highway engineering.

As a pure freight railway form, heavy haul railway[1] has characteristics of large design load, heavy axle load[2] and frequent train load compared with passenger dedicated lines, high-speed railways, passenger and freight railway lines. When the Mongolian China heavy haul railway crosses the Hanjiang River, considering the boundary conditions of the 5x120m highway continuous beam bridge in the downstream and the economy, according to the comparison and