

Study on Tensional Countermeasures for the Parallel Strand Stayed Cable Based on the Equivalent Model with Series-parallel Connected Springs

Dongli ZHUANG

Tongji Architectural Design (Group) Co., Ltd, Shanghai, China

Rucheng XIAO

Tongji University, Shanghai, China

Xiao DA

Tongji University, Shanghai, China

Contact: QL31ZDL@tjad.cn, ZDL606@126.com

Abstract

For easily calculating the cable tension force of cable-stayed bridges with parallel strand stayed cables, the cable-stayed bridges were simplified as a equivalent model consisting of serially or parallelly interconnected springs which were employed to instead of bridge elements such as towers, cables, and beams. . For this equivalent model, simplified formulas for calculating the tension force were deduced, and a corresponded calculation process was presented. The comparison of these proposed formulas with other calculation methods showed that the proposed formulas are reliable. A parametric study centralized on the proposed formulas was carried out in order to understand the characteristics of them. The study results suggested that stiffness ratio and tension coefficient had significant effects on the discrepancy of calculation, and the tension coefficient was more sensitive to the discrete discrepancy and total discrepancy of the final cable's force; equivalent tension has many advantages in practical construction operations, so a reasonable tensional countermeasure should be chosen according to the structural stiffness and the right tension coefficient should be estimated according to the tension range of jack at the same time.

Keywords: the equivalent model of series-parallel connected springs; simplified algorithm; variance analysis; ratio of stiffness; coefficient of tension; tensional countermeasures