Temperature-Induced Deformation Of Multi-Span Suspension Bridges

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The varying temperature dominates the in-service quasi-static deformation of long-span suspension bridges during the operation. The temperature-induced deformation of a bridge is usually calculated using complex 3D finite element analysis, which is time-consuming and cannot capture the inherent mechanism. In this study, we derive general, succinct analytical formulas of the thermal deformation of multi-span suspension bridges for the first time. The analytical formulas take account of the tower flexural stiffness and the elastic deformation of cables caused by the tension changes. The derived formulas are validated by the field monitoring data of the four-span Maanshan Yangtze River Bridge. A succinct unified one-dimensional formula is further derived for practical use. The present study not only provides a simple and general analytical solution to the temperature-induced deformation of long-span suspension bridges, but also assists engineers in understanding the mechanism.