**Safety Evaluation of An Actual Cable-Stayed Bridge With A Steel Arch Tower**

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**Abstract.** Some safety aspects of an actual cable-stayed bridge with a steel arch tower have been investigated for practical consideration. First, the temperature effects on the bridge main components were analysed to explore the time-varying mechanisms of the cable forces, the tower obliquity and the main girder stress. The temperature coupling effect on the cable forces was analysed, and a long short-term memory neural network was trained using the actual temperatures and cable forces. Subsequently, new measured temperature data were input into the network for predicting the cable forces. Second, to solve the problems of huge monitoring data and the calculation difficulty in bridge condition assessment, a series of 3A indicators are proposed including the Amplitude offset, the Abnormal degree and the Average value fluctuation. These indicators intuitively reflected the monitoring response variations of the bridge components during a period of time. Compared with the existing indicators, the calculation of the 3A indicators was easier to comprehend and handle for field engineers. After that, a comprehensive safety index incorporating weight coefficients is further defined to consider the combined influence of the bridge girder, the tower and the cables. Thereby, the safety state of the bridge superstructure was evaluated by a score ranging from 0 to 100. The analysis results of this actual bridge have revealed the potential application of the proposed indicators to the preliminary safety evaluation of long-span bridges.

**Keywords:** Safety evaluation, Cable-stayed bridge with a steel arch tower, Temperature effects, Long short-term memory neural network, 3A indicators, Comprehensive safety index