



## Analysis of Performance Evaluation Index for bridge group networking monitoring and collaborative supervision

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### Abstract

With the number of bridges increases, the bridge health monitoring (BHM) technique is developing from single bridge monitoring to collaborative supervision of bridge group. Therefore, there are many technical problems need to be solved especially the performance evaluation index for bridge group network. This paper analyses the performance evaluation index of the bridges and bridge group network, establishes the performance evaluation index for bridge group based on rating factor (RF) and technical condition evaluation index. Based on bridge field testing and monitoring data, bridge technical condition evaluation index and performance evaluation method for bridge group are proposed. A case study demonstrates that the research results provide support for bridge group networking monitoring and collaborative supervision.

**Keywords:** bridge; performance; evaluation index; bridge network; rating factor; reliability index.

### 1 Introduction

Bridge structures play a significant role in highway networks, due to it involves safety, reliability, and applicability in highway network operation. Tens of billion passengers and tens of billion tons of goods are transported on highway and road networks in China every year according to “Statistical bulletin on the development of China's transport industry in 2019”. In highway networks, bridges provide the important links to connect the traffic nodes. Therefore, it is necessary to ensure that the bridge structure require to be maintained at a certain level of safety and serviceability during their life cycle. However, with the increasing number of aging bridges, the needs for existing bridges maintenance, repair, and rehabilitation are difficult challenge that bridge managers must to be faced<sup>[1-3]</sup>. The key object of bridge mangers is to find a reasonable way of evaluating technical condition

(including safety level) and distributing the maintenance funds for existing bridge<sup>[4]</sup>.

Performance evaluation for bridge network is the precondition to determine the reasonable maintenance strategy and funds allocating. Many scholars have carried out beneficial research on the performance evaluation of bridge structures and put forwards many theories and methods<sup>[5-7]</sup>. Performance evaluation Index for bridges including rating factor<sup>[8, 9]</sup>, reliability index<sup>[10-12]</sup>, damage index<sup>[13, 14]</sup>, image-based bridge condition index<sup>[15]</sup>, bridge health index<sup>[16]</sup> have been carried out and applied to specific bridges<sup>[17, 18]</sup>. For the actual bridge structure, regular testing and monitoring collect a large amount of data including environment parameters, traffic load data, and structural responses. The key problem is how to calculate the performance evaluation index according to the obtained date and information