

Condition Assessment of a Steel Plate Girder Railway Bridge

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Summary

Condition assessment of bridges provides information regarding the intensity and extent of observed defects, the cause for these defects and possible deterioration processes that have strong impact on the safety and service life of structures. The present study focuses on Bridge number 102 on the Castle Rock - Kulem section of the South Western Railway zone, in India. The bridge has been constructed with steel girders placed on stone masonry piers in two spans. The bridge was part of a meter gauge line that underwent gauge conversion and forms the primary line for the transport of iron ore. The axle load is at present at 22 t based on an in-house assessment of the Indian Railways and they are considering the possibility of further enhancing the axle load to 25 t. In this study, details of field measurements undertaken at the bridge under ambient and design train traffic and analytical work based on finite element analysis are presented. Conclusions on the state of the bridge within the framework of the information available and inferred are presented.

Keywords: Condition and structural assessment, Repair and strengthening, Structural health monitoring and modeling optimization.

1. Introduction

Most of the railway bridges in the Indian Railway system that have been built several decades ago have deteriorated both in terms of strength and stiffness due to a variety of reasons. These bridges have been designed for live loads and service conditions that have changed drastically with time. Increased axle loads and traffic density have necessitated bridge owners to get the bridge condition assessed in order to determine their residual structural strength and identify strengthening measures to be taken for safe performance. Condition assessment provides information regarding the intensity and extent of observed defects, the cause for these defects and possible deterioration processes that have strong impact on the safety and service life of structures. Furthermore, this information forms the basis for estimating the residual structural capacity and possible remedial work that needs to be undertaken.

The present study focuses on Bridge number 102 on the Castle Rock - Kulem section of the South Western Railway zone. The bridge has been constructed with steel girders placed on stone masonry piers in two spans. The bridge was part of a meter gauge line that underwent gauge conversion and forms the primary line for the transport of iron ore. Over the years, the freight traffic has increased on this section. The axle load till a few years ago was classified as 18 ton axle load has undergone an upward revision to 22 t axle based on an in-house assessment of the Indian Railways. At present, there has been a growth in freight traffic in this section, in particular for iron ore and coal movement, and the Indian Railways is considering the possibility of further enhancing the axle load to 25 t immediately with additional upward revisions at a later date.