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Performance evaluation of in-service open web girder steel railway bridge through full scale experimental investigations

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Abstract. Civil infrastructures, such as bridges and tunnels are most important assets and their failure during service will have significant economic and social impact in any country. Behavior of a bridge can be evaluated only through actual monitoring/measurements of bridge members under the loads of interest. Theoretical analysis alone is not a good predictor of the ability of a bridge. In some cases, theoretical analyses can give less effect than actual since theoretical analyses do not consider the actual condition of the bridge, support conditions, level of corrosion and damage in members and connections etc. Hence actual measurements of bridge response should be considered in making decisions on structural integrity, especially in cases of high value bridges (large spans and major crossings). This paper describes in detail the experimental investigations carried out on an open web type steel railway bridge. Strain gages and displacement transducers were installed at critical locations and responses were measured during passage of locomotives. Stresses were evaluated and extrapolated to maximum design loading. The responses measured from the bridge were within the permissible limits. The methodology adopted shall be used for assessing the structural integrity of the bridge for the design loads.

Keywords: open web girders; railway bridges; stress; strain; performance evaluation

1. Introduction

Civil infrastructures, such as bridges and tunnels are most important assets and their failure during service will have significant economic and social impact in any country. In general, bridge monitoring is aimed at providing the state of the structure so that any damage or deterioration can be detected at an early stage and remedial measures can be suitably taken up. Full scale experimental investigations provide more important data for research and development in the field of bridge engineering (Zhang *et al.* 2007). Through recent years performance evaluation of bridges were carried out using various types of sensors such as strain gauges, accelerometers, global positioning systems (GPS), fiber optic sensors, total stations, etc. (Chang 1997, 1999, Ansari 2005, Balageas 2002, Mufti and Ansari 2004). Behavior of a bridge can be evaluated only through actual monitoring/measurements of bridge members under the loads of interest. Theoretical analysis alone is not a good predictor of the ability of a bridge. In some cases, theoretical analyses can give less effect than actual since theoretical analyses do not consider the actual condition of the bridge,

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