**Title:** Assessment of structural adequacy of Bridge No. 134 of RSDO standards composite bridge girder and recommendations for retrofitting of superstructure of bridge (if any)

**Sponsoring Agency:** East Central Railway (ECR)

**Project Leader:** Mr. K. Saravana Kumar

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**Scope/Objectives:**

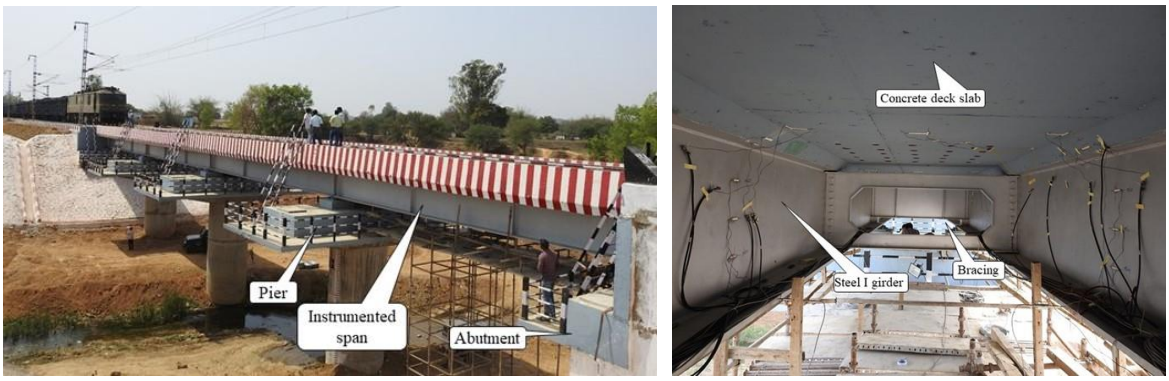
(i) Visual inspection for assessing the condition of the superstructure of the identified spans of the bridges
(ii) Non-destructive evaluation for condition assessment of the bridge spans to check for the strength, durability and condition of the superstructure
(iii) Instrumentation of the identified bridge spans using LVDTs, strain gauges and accelerometers
(iv) Field testing of bridge spans for different static and dynamic test cases with varying speeds of test train formation of 25 tonnes standard loading or train of maximum loading standard available and to extrapolate the result for required loading standard.
(v) Signal processing and analysis of field test data for assessing the structural performance of the bridge spans
(vi) Numerical simulation studies for assessing the structural responses at elemental level, validation with field data
(vii) Assessing the structural adequacy of the identified bridge spans, and formulation of remedial/retrofitting measures for mitigation of excessive deflections, if any.
(viii) Preparation of the technical reports on field investigations, observations and specific recommendations

**Objectives Achieved/ Progress made:**

In this project, field investigations and numerical simulation studies were carried out on the super- structure of composite bridge (BR134) to evaluate the structural adequacy of the super -structure under 25T of loading. During the field investigations, instrumentation on various parts of the super-structure, i.e., rail, concrete slab, two I-girders, bearings was carried out in order to evaluate the response under static and dynamic test cases conducted using the test train formation provided by ECR. Instrumentation on the I-girders was carried out to measure the displacement along the length of the girder at five critical locations and strain measurements were carried out at three different locations across the depth of the girder, along the slab with and near the concrete-steel interface. Non-destructive testing (NDT) on the concrete slab was also conducted using ultrasonic pulse velocity (UPV) and rebound hammer to assess the overall quality of concrete. Based on the studies, it was observed that the concrete quality is found to be good.

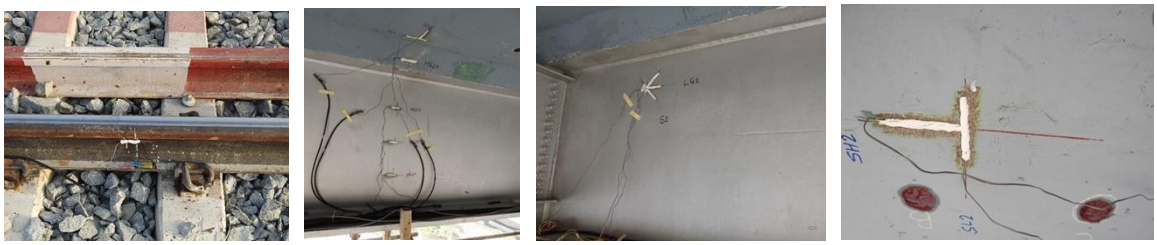
As the field study could not be conducted using the intended 25T loading, the same was performed assessed using the validated numerical studies. The numerical validation was thoroughly carried out using the results obtained from field investigation. Numerical simulation

was carried out for response evaluation (both static and dynamic) of the super-structure under 25T loading. It was found that the composite superstructure is performing well under all the load cases considered in the present study. The interface behaviour (steel-concrete interface near mid- and quarter- span) shows the required integrity for complete force transfer.



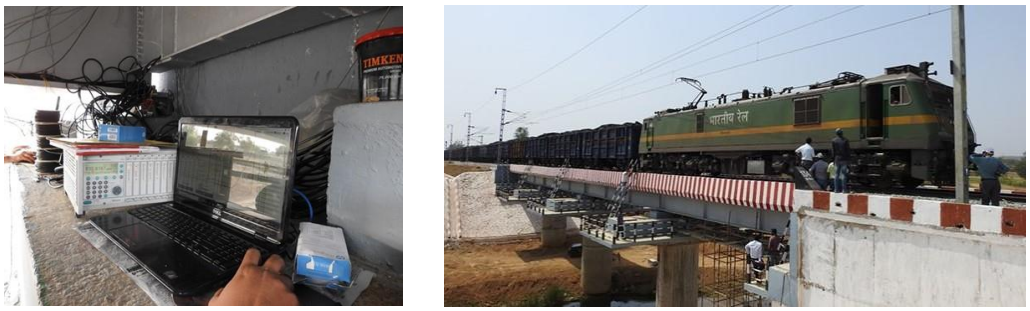

**(a)** **(b)**

**Fig. 1:** General view of (a) the bridge and (b) composite girder



(a) (b) (c) (d)

**Fig. 2:** Typical arrangement of strain gages on (a) rail, (b) along the depth of the girder, (c) near to support and (e) at deck slab



(a) (b)

**Fig. 3:** (a) High accuracy data acquisition system and (b) test train formation for loading