

## Residual Fatigue Strength Assessment & Rehabilitation of Rajendra Setu, Mokama, India-Case Study

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### Abstract

Rajendra Setu (Rail Cum Road Mokama Bridge) was constructed in 1959 over river Ganga on NH-31 is of Span 3 x18,30m + 2 x 30,50m +14 x 121m + 2x30,5 m + 3x18,3m. The bridge was originally designed for BGML loading at railway level and 2-Lane Class A or 1-Lane Class AA at roadway level. East Central Railway intends to use the train for 25T – 2008 loading which is of higher loading standard than it was originally designed for and wanted to check the residual fatigue strength and to do the necessary modification for this purpose. This paper presents the steps followed for assessing the residual fatigue strength of the truss members and the railway & roadway floor system, i.e. the railway stringers & its connections and roadway stringers. The reason for the damage of the connection of the railway central stringers with rail cross are also assessed and presented in the paper along with its remedial measures.

**Keywords:** Fatigue Strength, Fatigue Load, Cumulative Damage, Detail Category, Residual Fatigue Strength, Railway Stringers, Roadway Stringers, Superstructure.

### 1 Introduction

The Road cum Rail Bridge, popularly known as Rajendra Setu, is a bridge across the Ganges near Hathidah in Patna district and Simaria in Begusarai district. The rail traffic is located below the road level over the bridge. This was the first bridge constructed post-independence, to link the northern and southern portions of the state of Bihar. Construction of the bridge started in October 1955 and the bridge was inaugurated in 1959 by the then prime minister of India, Pt. Jawaharlal Nehru, and the then Chief Minister of Bihar, Shri Krishna Sinha. Site selection for this bridge was

carried out by an eminent British Engineer, Mr J M Fenton, who was appointed by the Railway Board in 1946 to investigate and report the best site for this bridge and to conduct the discharge measurements, borings. etc. His project report was submitted in April 1947 and the site recommended therein was later confirmed by model experiments conducted at the Hydrodynamic Research Station, Pune. Sir M. Visvesvaraya, the eminent engineer-statement, was subsequently appointed by Govt. of India to appraise the site and finally he gave the stamp of approval for the site. Figure 1 shows the river bed profile and alignment which was fixed in 1955. The location was about 7,5 Km from