

Title: Assessment of structural stability of RCC vehicular underpass (Box type) and RE wall of road over bridge (ROB) at Basettihalli, Karnataka

Sponsoring Agency: South Western Railway, Bengaluru

Project Leader: Dr. B.S.Sindu

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Scope/Objectives:

- Finite element (FE) modelling and analysis of VUP under designed load conditions, additional surcharge conditions after construction as well as for the retrofitted at-present condition (modified structural configuration (with props) and the prevailing loading conditions) to evaluate its structural adequacy
- Non-Destructive testing (NDT) on the structural members of VUP to assess the condition, durability and strength properties of the concrete
- Instrumentation and load testing of the VUP for field measurement of the critical response parameters towards evaluating the structural performance of the VUP
- Checking the structural adequacy of the VUP under prevailing at-present modified structural configurations and load conditions and recommendations of retrofitting scheme, as found appropriate
- Investigations on the existing state of RE wall and suitable recommendations of retrofitting scheme
- Preparation of technical report including the field investigations carried out, structural adequacy of existing VUP and RE wall, detailed finite element analysis studies and remedial measures (if any)

Objectives Achieved/ Progress made:

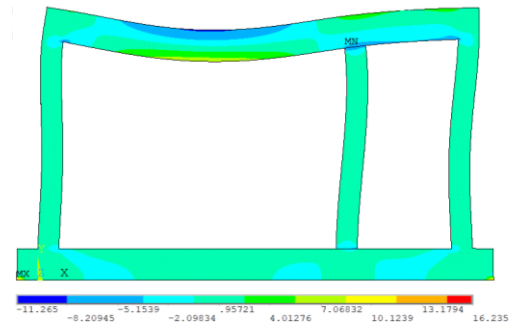
The vehicular underpass (VUP) under consideration is the box type reinforced concrete (RC) construction in the road over bridge (ROB) at Basettihalli, Karnataka. Due to the excessive deflection along the width of the VUP, additional surcharge load (as against the design load) and provision of rail encased in concrete column supports along the width of VUP, M/s South Western Railway entrusted CSIR-SERC to assess the structural stability of VUP. Further, a portion of reinforced earth (RE) wall of the ROB had collapsed which was retrofitted using soil nailing whose stability also had to be evaluated. In order to evaluate the structural adequacy, extensive field investigations and detailed finite element (FE) simulations were carried out for different load cases and load combinations. Instrumentation was carried out on the bottom slab, column supports and walls of the VUP to measure the vertical and lateral strain and displacements in addition to opening displacement of existing crack. Load testing with predetermined vehicular loads (incremental) was carried out and the response of the sensors recorded in a data logger were analysed with appropriate noise filtering. Non-destructive testing (NDT) using rebound hammer and ultrasonic pulse velocity was used to evaluate the quality of concrete in the slab and walls in addition to core extraction and laboratory compression testing. Laboratory investigations (full-scale pull out experiments) were also carried out on the RE panel system using computer-controlled actuators to determine the load

carrying capacity and the mode of failure. Based on the responses obtained from the field investigations, numerical simulations and laboratory experiments, the structural adequacy of RE wall and VUP was evaluated and appropriate retrofitting scheme was suggested.

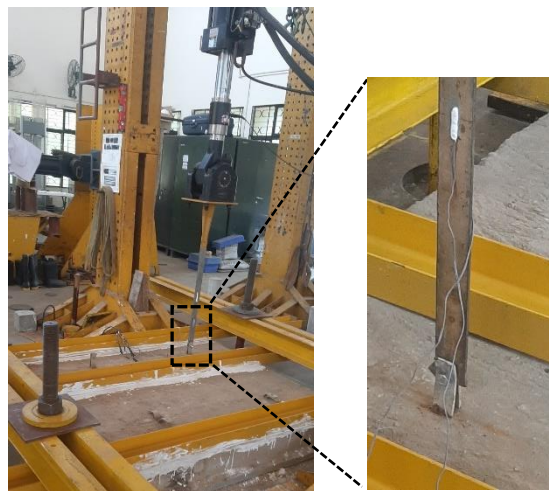
a retrofitting scheme was suggested to enhance the stability of VUP.



(a) Instrumented VUP for load testing



(b) Stress distribution in the FE model



(c) Laboratory test on RE panel system

Fig. 1: Investigations on the RCC Vehicular Underpass and RE wall of Road Over Bridge