

Comparative Study of RCC Vs Steel Truss Bridges Using Staad.Pro Under Dead Load And Live Loads

BHUMIKA L¹, AARYA B², ANUSHKA B³, BHUMIKA A⁴, P. S. NANDURKAR⁵
^{1,2,3,4,5}Department of Civil Engineering, JSPM's Rajarshi Shahu collage of engineering

Abstract Bridge failures emphasize the importance of selecting durable and structurally reliable systems. This study presents the analytical evaluation of a Reinforced Cement Concrete (RCC) bridge proposed as a replacement for a 32-year-old collapsed steel truss bridge. The RCC bridge was modeled and analyzed using Staad.pro software under dead load and live load conditions. Load combination was generated to evaluate displacement and structural performance. The results indicate that the RCC bridge satisfies strength and serviceability requirements while offering improved durability and reduced maintenance demand. Based on analytical findings, RCC is justified as a reliable construction solution for long-term infrastructure performance.

Index Terms- RCC Bridge, Staad.Pro, Dead Load, Live Load, Wind Load, Displacement Analysis, Structural Stability.

I. INTRODUCTION

Bridges are critical infrastructure elements that must ensure safety, serviceability, and durability over their design life. Aging steel bridges are often vulnerable to corrosion, fatigue, and increasing maintenance requirements. A steel truss bridge that had been in service for approximately 32 years collapsed, highlighting the need for a more durable structural alternative. To address this issue, reconstruction using Reinforced Cement Concrete (RCC) was proposed. RCC structure provide better resistance to environmental deterioration, improved stiffness, and reduces long-term maintenance compared to exposed steel systems.

This study focuses on the structural analysis of the proposed RCC bridge using Staad.pro software

II. CASE STUDY: COLLAPSE OF 32-YEAR-OLD STEEL BRIDGE

The previously existing steel truss bridge had been functioning for nearly three decades. Overtime, environmental exposure led to corrosion of steel

members. Repeated vehicular loading caused fatigue stresses, gradually reducing structural capacity.

The collapse emphasized the need for:

- Improved durability
- Higher stiffness
- Better load distribution
- Reduced maintenance dependency
- Based on these considerations, reconstruction using RCC was analytically evaluated in this study.



A. Methodology Software used



The structural modeling and analysis were performed using Staad-pro software. The software was used to create a three-dimensional model of the proposed

RCC bridge and to evaluate structural response under applied loads.

B. Modeling of RCC bridge

The RCC bridge was modeled with appropriate:

- Material properties (concrete grade)
- Member dimensions
- Support conditions
- Load assignments

III. LOAD CALCULATIONS

The following load combinations were considered:

- Dead load (DL)
- Live load (LL)
- DL+LL
- 1.5 (DL+LL)

These combinations were used to evaluate maximum displacement and structural performance.

IV. RESULT AND ANALYSIS

After performing the analysis in Staad.pro, displacement and structural response results were obtained. The maximum displacement under combined loading remained within permissible limits. The RCC bridge demonstrated uniform load distribution and stable behaviour. Due to its monolithic nature, the RCC system provides enhanced stiffness and reduced deflection compared to segmented steel truss systems.

I. Structural justification of RCC bridge based on analytical evaluation, the RCC bridge is justified for reconstruction due to the following advantages:

- Higher structural stiffness
- Lower displacement under load
- Better durability against environmental exposure
- Reduces corrosion issues
- Lower long-term maintenance cost
- Improved overall structural stability

These characteristics make RCC a more reliable alternative for long-term bridge performance.

V. CONCLUSION

The proposed RCC bridge was successfully modeled and analyzed using Staad-pro under dead and live load conditions. The displacement values were found to be within permissible serviceability limits, confirming structural adequacy. Considering the collapse of the 32-year-old steel bridge and the durability advantages of RCC, reconstruction using RCC is structurally and practically justified. The study confirms that RCC bridges offer improved stability, safety, and longevity for infrastructure development.

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