Dynamic Behavior of Truss Bridge Structures Subjected to Moving Load

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Abstract:

This study presents a comprehensive analysis and design of steel truss railway bridges, focusing on the comparative performance of Warren, Pratt, and Howe trusses under static and dynamic loading conditions. Utilizing STAAD Pro software, the research evaluates a 366-meter-long railway bridge with specific seismic and wind considerations, designed per IS 1893 (Part III): 2016 and IS 875 (Part III): 2015 guidelines. Key parameters such as time period, natural frequency, displacement, and acceleration were analyzed using data from the 2001 Bhuj earthquake to simulate realistic seismic conditions. Results highlight the superior performance of the Warren truss, which demonstrated significantly lower displacement, shorter time periods, higher natural frequencies, and reduced acceleration compared to Pratt and Howe trusses. Structural optimization of the Warren truss reduced its self-weight by 14.2%, enhancing its economic viability. This study underscores the effectiveness of the Warren truss for railway bridge applications, providing insights into efficient and resilient design strategies for modern infrastructure.