RAIL STRUCTURE INTERACTION ANALYSIS OF OPEN WEB STEEL GIRDER FOR PROVIDING CWR

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Rail-Structure Interaction (RSI) is a critical aspect of railway bridge design, involving the transfer of vertical and horizontal train loads, as well as thermal effects, from the rails to the bridge deck and substructure. This interaction influences axial stresses in the rails, caused by braking, traction, temperature variations, and deck end rotations due to bridge bending. RSI also affects the relative horizontal displacements between the rail and deck. When these stresses and displacements exceed the permissible limits defined in UIC 774-3R, (International Union of Railways) code, adjustments such as modifying support stiffness, rail fixing methods, or incorporating expansion devices can help bring them within acceptable limits. The analysis is carried out in accordance with the UIC 774-3R Code of Practice, for simply supported Open Web Girder (OWG) of a railway bridge with a 109.9 m span, designed to carry a 25-ton 2008 axle load. Parametric RSI studies are conducted using MIDAS software to assess the impact of support stiffness, track parameters, end rotations, rail axial stresses, and rail-deck displacements. The analysis considers scenarios involving Continuous Welded Rail (CWR) and assesses their compliance with UIC 774-3R guidelines. Simulation results are validated against theoretical calculations derived from the code. The primary objective is to evaluate the feasibility of adopting CWR on the bridge, or to determine the need for Switch Expansion Joints (SEJ) or other suitable expansion devices based on RSI performance outcomes.

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