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Evaluation of Current Methods in Modelling and Analysis of Track with Jointed Rails

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Abstract : In railway tracks, two adjacent rails are either welded or connected using bolted jointbars. In recent years the number of bolted rail joints is reduced by introduction of longer rail sections and by welding the rails at location of some joints. However, significant number of bolted rail joints remains in railways around the world as they are required to allow for rail thermal expansion or to provide electrical insulation in some sections of track. Regardless of the quality and integrity of the jointbar and bolt connections, the bending stiffness of jointbars is much lower than the rail generating large deflections under the train wheels. In addition, the gap or surface discontinuity on the rail running surface leads to generation of high wheel-rail impact force at the joint gap. These fundamental weaknesses have caused high rate of failure in track components at location of rail joints resulting in significant economic and safety issues in railways. The mechanical behavior of railway track at location of joints has not been fully understood due to various structural and material complexities. Although there have been some improvements in the methods for analysis of track at jointed rails in recent years, there are still uncertainties concerning the accuracy and reliability of the current methods. In this paper the current methods in analysis of track with a rail joint are critically evaluated and the new advances and recent research outcomes in this area are discussed. This research is part of a large granted project on rail joints which was defined by Cooperative Research Centre (CRC) for Rail Innovation with supports from Australian Rail Track Corporation (ARTC) and Queensland Rail (QR).

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