eJSE International

Special Issue: Electronic Journal of Structural Engineering 13(1) 2013

Structural and Material Characterisation of Insulated Rail Joints

N. Zong[1*], D. Wexler[2], & M. Dhanasekar[1]

[1]*School of Civil Engineering and Built Environment, Science and Engineering Faculty, Queensland University of Technology, Brisbane, Australia*

[2]*School of Civil Engineering and Built Environment, Science and Engineering Faculty, Queensland University of Technology, Brisbane, Australia*

**Corresponding author:* roger.zong@qut.edu.au

ABSTRACT: Insulated rail joints are designed in a similar way to butt jointed steel structural systems, the difference being a purpose made gap between the main rail members to maintain electrical insulation for the proper functioning of the track circuitry at all times of train operation. When loaded wheels pass the gap, they induce an impact loading with the corresponding strains in the railhead edges exceeding the plastic limit significantly, which lead to metal flow across the gap thereby increasing the risk of short circuiting and impeding the proper functioning of the signalling and broken rail identification circuitries, of which the joints are a critical part. The performance of insulated rail joints under the passage of the wheel loading is complex due to the presence of a number of interacting components and hence is not well understood. This paper presents a dynamic wheel-rail contact-impact modelling method for the determination of the impact loading; a brief description of a field experiment to capture strain signatures for validating the predicted impact loading is also presented. The process and the results of the characterisation of the materials from virgin, in-service and damaged insulated rail joints using neutron diffraction method are also discussed.

Keywords: Beam-columns, Joints, Concrete, Steel, Finite element analysis