# Influence of concrete damping on impact vibrations of railway prestressed concrete sleepers

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**Abstract**. For over 60 years, railway concrete sleepers have been installed in ballasted railway tracks globally. Their key duties are to help redistribute wheel loads onto track structure and to secure a stable track gauge for safe running of trains and rolling stocks. In practice, railway sleepers experience dynamic loading conditions; however, its damping characteristic has not been considered because very little damping can be exploited in concrete and steel. To be able to cater heavier and faster trains, the dynamic and impact loading conditions cannot be underestimated. Statistically, almost a quarter to track load spectra is typically of transience and high intensity. Pre-mature damage or failure of track components can take place at a faster rate when the damping is very low. A single sleeper failure may not affect open, plain track operations but it can give rise to the risks of rail breaks at rail joints, welds, bridge ends, switches and crossings, curved track, etc. Such the risks can later result in detrimental train derailments. This is thus very important to consider the failure of sleepers in a case by case basis that is suitable for the track type, track condition and level of maintenance and operations. This paper will highlight the influence of damping on the dynamic impact responses of railway concrete sleepers in a track system. An established and validated finite element model of sleeper has been utilised in this study. The model has been validated by experimental results. The insight into the impact vibration suppression of railway sleepers will help track engineers to decide the better choice of advanced materials for manufacturing railway concrete sleepers.

**Keywords:** damping; concrete sleepers; impact vibration; railway tracks

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