TOP 10

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RA7

Transport Infrastructure

Key Characteristics: A methodology for comprehensive analysis of track transition zones • including Experimental analysis • Short-term and Long-term numerical analysis • Design variation analysis •

A Methodology for the Comprehensive Analysis of Track Transition Zones

Transition zones in railway tracks are locations with considerable changes in the vertical stiffness of support, for instance at bridges, tunnels, etc.

In such locations, the variation of the vertical stiffness, together with the differential settlement of tracks, lead to considerable changes in track geometry, resulting in extra maintenance cost and deterioration of passenger comfort.

This project proposes a comprehensive methodology for the analysis and improvement of the track performance in transition zones. The analysis methodology consists of three parts and is capable of performing Experimental analysis, Short-term numerical analysis, Long-term numerical analysis, Design variation analysis for transition zones. The first part is an advanced measurement technique, which uses a DIC (Digital Image Correlation) device to measure the dynamic displacements of rails at multiple locations along the track in transition zones.

This measurement technique is able to evaluate the current condition of transition zones. The second part is an FE (Finite Element) model of transition zones which considers stiffness variation and differential settlement at the same time.

The model is capable of modelling the realistic settlement curve of rails, the hanging distance of sleepers. Hence, it can study the dynamic responses of transition zones during passing trains. The third part is an iterative procedure to predict the track settlement in transition zones, which combines the FE model of transition zones and an empirical settlement model of ballast. Using the procedure, the long-term behaviour of transition zones can be explored. Based on the analysis results, the current condition, dynamic behaviour, long-term settlement and the possible countermeasures of the transition zone can be studied, which may provide guidance for the maintenance staff •