

# Field Investigation on Vibration Behavior of Railway Track Systems

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**Abstract:** Investigations on vibration behaviors of railway track systems were attempted in this research. This was made by conducting a comprehensive field investigation into the free vibration of track systems and response of tracks to train moving loads. In-situ modal analysis was used in a railway track field as an efficient method of investigating dynamic properties of railway track systems. Natural frequencies and mode shapes of the track system in different in-situ track conditions were obtained for the first time. The sensitivity of the natural frequencies of the track to the types of sleepers, fastening systems, ballast conditions, and rail joints were studied. Efficiency of rail welded joints in CWR tracks and the effects of replacing timber sleepers with concrete sleepers on dynamic behavior of a track were investigated. Advantages of flexible sleeper fastening system from the aspects of serviceability and passenger riding comfort were discussed. The effects of the track accumulative loading as a main indicator of ballast degradation on track dynamic behavior were studied. Rail deflections were calculated by using auto-spectra obtained from vibrations of the track under trainloads, leading to the development of a new mathematical expression for the calculation of the rail dynamic amplification factor.

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