

## Investigating the Dynamic Response of the Ballast

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**Abstract :** Understanding the stability of rail ballast is one of the most important aspects in the railways. An unstable track may cause some issues such as unnecessary vibration and ultimately loss of track quality. The track foundation plays an important role in the stabilization of the railway. The dynamic response of rail ballast in the vicinity of the rail sleeper can affect the stability of the rail track and this has not been studied in detail. A review of literature showed that most of the works focused on the area under the concrete sleeper. Although there are some theories about the shear (longitudinal) effect of the rail ballast, these have not properly been studied and hence are not well understood. The stability of a rail track will depend on the compactness of the ballast in its vicinity. This paper will try to determine the dynamic response of the ballast to identify its resonant behaviour. This preliminary research is one of several studies that examine the vibration response of the granular materials. The main aim is to use this information for future design of sleepers to ensure that any dynamic response of the sleeper will not compromise the state of compactness of the ballast. This paper will report on the dependence of damping and the natural frequency of the ballast as a function of depth and distance from the point of excitation introduced through a concrete block. The concrete block is used to simulate a sleeper and the ballast is simulated with gravel. In spite of these approximations, the results presented in the paper will show an agreement with theories and the assumptions that are used in study the mechanical behaviour of the rail ballast.

**Keywords :** ballast, dynamic response, sleeper, stability

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