CHARACTERISTIC ANALYSIS OF EMBEDDED WAVE BARRIER MATERIAL BESIDE RAILWAY TRACKS

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Rail transport is one of the most effective modes of transporting goods and people among various access points. It has several benefits compared to some of the other modes of transport, such as safety, cost effectiveness, time saving, and high capacity. Forces from the result of passing vehicles and irregularities at the wheel-rail interaction, penetrate through wheel into the track, and generates vibration. The scenarios of increasing traffic congestion and civil infrastructure development in Sri Lanka, have led to the concern about the improvement of railway transportation free from propagation of vibration through ground. Using embedded barrier material within a trench beside the railway track is an effective active control strategy practiced in most of the Railway transportation sectors around the world. In this research, characteristics of the material which is used as a vibration controlling layer embedded beside the railway track within the subsoil are analysed. Initially a finite element model of a railway track was developed, and then it was validated with the field vibration measurements available in the literature. Later a parametric study was carried out by varying the properties of the vibration controlling layer within the subsoil. The vibration characteristics were compared at 2 and 3 m depths, for different Elastic modulus, density, and void ratios of the material. It was evident that barrier material with lower elastic modulus provides a better vibration screening performance. If the available barrier material has a high elastic modulus, it should be constructed deep enough to provide a better vibration screening performance. For a given depth of an embedded barrier layer, there will be an optimum unit weight, which provides a high performance of screening. It was also found that, 2 m deep barrier provides better performance than the 3 m deep barrier for a given unit weight. Increasing the void ratio will increase the pores inside the material, and hence will increase the performance of the barrier. A shallow barrier provides better performance up to a certain value of void ratio, beyond which the performance is independent of the depth of the barrier. Overall, findings of this research elaborate the optimum material characteristics of a vibration controlling layer for train induced ground vibration in different depths.

Keywords: train induced ground vibration; embedded wave barrier material; finite element modelling; peak particle velocity

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