

A study on the long distance propagation mechanism of low frequency ground vibration on the viaduct and its effective isolation method by a few vibration isolation walls

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In order to examine the long distance propagation mechanism of environmental ground vibration which makes a viaduct, it checked that vibration generated when local measurement was performed for the viaduct which the oscillating problem actually generated and large-sized vehicles the viaduct spread the foundation, and spread to a long distance. In order to examine this mechanism, the experiment with a model using the similarity rule in a gravitational field and numerical simulation analysis were carried out. As a result, the stake of the bridge pier substructure of the viaduct carries out an action to the perpendicular direction and a horizontal direction simultaneously, vibration enters into a lower layer part, and it is emitted from a deep position, and is a wave motion impedance ratio of a lower layer part and the upper levels. It was amplified and having spread to a long distance that it is hard to decrease some of the frequency component from the dispersion property of the foundation was solved.

The hollow composition isolation wall made of concrete and EPS (Expanded Poly Styrene) was investigated to reduce transmission of vibration. A full-scale experiment was conducted with the wall. The vibration was given by free falls of a weight to simulate vibration from construction works and vehicles. As for effect on a decrease in vibration, including embedded depth of the composition isolation wall showed the effect of 4.5dB on the average even in about 1/4 of the wavelength 3Hz in the nearby low frequency number of vibration. And, it was found that the range where the diffraction from the end part of the isolation wall didn't affect was within $\theta=70^\circ$ behind the wall. Based on the results, a simple method to estimate the reduction of vibration by the composition wall was proposed. The proposed method estimated the vibration reduction well, and it was found that the method can be used to quantitatively estimate the efficiency of composition isolation wall.

It is examined about the new ground vibration isolation wall which a scrap tire was used for the ground vibration problem as by this paper. In other words, a full-sized isolation wall was laid about the compression type isolation wall which the tire of the original form was used for, and a tire and which was arranged in actual field, excitation experiment which an actual source of vibration was presumed was enforced, and effect on a decrease in vibration by this isolation wall was observed. Effect on a decrease of 3dB-12dB was confirmed in the original form type isolation wall as that result. Moreover, the examination related to effect on a spring of tire gum in the value evaluated from the wave penetration theory was added, and compared with experiment value as an appraisal method of effect on a decrease in vibration by the isolation wall. It was proved that it was based on effect on compounding of two effect from almost reproducing found value by this appraisal method with effect on a decrease in vibration by the isolation wall of the proposal.