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| Project Title: | Isolation of Environmental Ground Vibrations by Sheet Pile and Waste Rubber Chips: Field Experiments and Numerical Modeling |
| Project Coordinatior: | Assoc. Prof. Dr. Deniz ÜLGEN |
| Project Abstract: | Ground vibrations generated by traffic and construction activities have become an important issue associated with urbanization and technological development. These vibrations may disturb human comfort and reduce the quality of life. Recently, isolation of ground vibrations has gained importance and has been included in national strategic action plan like in other developed countries. The proposed project is aimed to provide an isolation solution for the ground vibrations using wave barriers. Very few experimental and field data are currently available regarding the isolation effectiveness of wave barriers. Therefore, isolation behavior of wave barriers has not been sufficiently clarified yet. In this project, isolation performance of sheet pile wave barriers is planned to be investigated alone and together with waste rubber chips and open trench wave barriers by field experiments. These experiments will be integrated with numerical analyses to provide a procedure for engineers in the preliminary design stage. Originality of this study is the investigation of coupled behavior of sheet pile and rubber chips wave barriers in vibration isolation. Thus, advantages of both high–density and low-density wave barriers are taken into consideration to increase isolation performance of the system. There is no field study in the literature evaluating the isolation behavior of this composite system. Furthermore, innovative contribution of this project is reutilization of rubber chips as a waste material. Herewith, a new usage area of a waste material will emerge within the scope of Ministry of Environment and Forestry’s “Zero Waste” campaign. The biggest disadvantage of the studies in literature is that vibration frequency range is very limited, and measurements are performed only for particular frequencies. To fill this gap in the literature, it is planned to use a mobile seismic shaker to generate harmonic frequencies in the range of 0-150Hz. Thus, ground vibrations at different frequencies generated by different vibration sources will be represented in the field tests. Vibrations will be measured by high-sensitivity accelerometers and geophones, then the isolation performance will be evaluated quantitatively. Finite element method will be utilized to model and validate the field experiments. The 3D numerical model will be calibrated by adjusting the soil parameters in a reasonable range. After validation, it is aimed to propose simple formulas or charts for enlightening the design engineers in the preliminary assessment of aforementioned wave barriers. Consequently, this research aims to isolate the environmental ground vibrations using wave barriers. Hence, the quality of life can be improved by reducing disturbing vibrations. The project will form a basis for ongoing and future studies on wave barriers. The findings of the study are expected to contribute technologies for vibration isolation and control. Moreover, results of the proposed project will contribute to engineering design and increase national competitive power. |
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