

# Evaluation of Wave Barriers on Ground Vibration Reduction through Numerical Modeling in Abaqus

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*Abstract: This paper aims to investigate the train-induced ground vibration and appropriate countermeasures using numerical modeling by Abaqus. First, the effect of appropriate boundary modeling in wave propagation studies is addressed by illustrating the application of non-reflecting boundaries in Abaqus using infinite elements. Second, the propagation of waves in the ground was investigated by applying an impact-type loading. Then, the attenuation of maximum acceleration on the surface ground was compared to the data from geotechnical centrifuge tests conducted at Tokyo Institute of Technology and the theoretical solutions. These comparisons confirmed the reliability of the numerical modeling by Abaqus in this study. Next, the effect of barriers in reduction of ground vibration was investigated by modeling a wave barrier at the transmission path. Three different types of barriers were evaluated considering their stiffness: Concrete wall, improved soil, and EPS. A benchmark model was also analyzed without any mitigation measure to evaluate the effectiveness of the wave barriers. Furthermore, the effects of both geometry (depth and width) and material of barriers on the vibration reduction were examined through a parametric study and the results were verified using the geotechnical centrifuge tests.*

*Keywords: Ground Vibrations, Wave Barriers, Mitigation Measures*

## 1. Introduction

Rapid development of urban areas requires the development of new railway lines to compensate the growing demand for public transportation; hence care should be taken in planning the new railway lines in the densely populated regions, and mitigation measures should be implemented to reduce the vibration levels. Zerwer et al. (2002) employed Abaqus in finite element modeling of