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Influence of Free Field Vibrations Due to Vibratory Pile Driving

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Abstract : Owing to the land scarcity in the modern-day, most of the construction activities are carried out closed to the existing buildings. Most of the high-rise buildings are constructed on pile foundations to transfer the design loads to a strong stratum below the ground surface. Due to the proximity of the new and existing structures, noise disturbances are prominent during the pile installation. Installation of vibratory piles is most suitable in urban areas. The ground vibrations developed due to the vibratory pile driving may cause many detrimental effects on the surrounding structures based on the proximity of the sources and nature of the structures. In the present study, an attempt has been made to study the severity of ground vibrations induced by vibratory pile driving. For this purpose, a three-dimensional finite element model has been developed in the ABAQUS/ Explicit finite element program. The couple finite/infinite element method has been employed for the capturing of propagating waves due to the pile installation. The geometry of the pile foundations, frequency of the pile driving, length of the pile has been considered for the parametric study. The results show that vibrations generated due to the vibratory pile installation are either very close or more than the thresholds tolerance limits set by different guidelines.

Keywords : FE model, pile driving, free field vibrations, wave propagation
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