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Vertical vibration of a large diameter pile embedded in inhomogeneous soil based on the Rayleigh-Love rod theory

Key words:

Large diameter pile, Vertical vibration, Transverse inertia effect, Rayleigh-Love rod model, Inhomogeneous soil



Large diameter pile is increasingly used in engineering, its integrity detection is therefore a problem of great significance.









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New approach presented in this paper



Rayleigh-Love rod model to consider the transverse inertia effect of pile

Three-dimensional axisymmetric model to simulate the soil and consider its radial inhomogeneity

Pile-soil governing equations

Parametric analysis based on the velocity admittance and reflected signals at the pile head

Comparisons with measured curve and other solutions

conclusions

- The peak time of the reflected signal from the pile tip is delayed when considering the transverse inertia effect of pile, thus making the detected pile length longer than its actual value



- The influence of the transverse inertia effect is related to the radius, elastic modulus, Poisson ratio of the pile and the radial inhomogeneity of the soil

verification



Low strain reflected wave signal detection method

Comparison with the measured curve demonstrated the validity of the present solution. It also showed that the influence of the transverse inertia effect plays an important role in the detection of the large diameter pile and should not be neglected.