

Timoshenko模型桩水平振动的动力刚度

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Dynamic Stiffnesses of Timoshenko Type Pile in Horizontal Vibration

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摘要 基于桩-土相互作用的连续介质模型, 利用桩的水平振动土阻抗结果, 将桩等效为Timoshenko梁, 研究线性黏弹性土层中Timoshenko模型端承桩水平振动的动力特性, 给出频率域内桩头动力刚度的半解析解, 得到动力刚度随频率的变化曲线. 在此基础上研究物性和几何参数对刚度的影响, 并与Euler-Bernoulli模型桩的结果进行比较. 研究表明, 端承桩水平振动的动态刚度受桩长细比、土软硬程度、水平激励频率等的影响, 这些结果可以为工程设计提供参考.

关键词: Timoshenko模型 端承桩 桩-土相互作用 动力刚度 水平振动

Abstract: Based on a continuum model of interaction between pile and soil, dynamic characteristics of horizontal vibration of a Timoshenko type end-bearing pile in a linear viscoelastic soil layer is studied by making the pile equivalent to a Timoshenko beam and using the existing results of soil resistance. Semi-analytical expressions of dynamic stiffness of the pile head is presented in the frequency domain. Variations of stiffness with respect to frequency are shown in terms of figures. Influences of the material and geometry parameters on stiffness are discussed. The results are compared with those obtained from the Euler-Bernoulli type model. It is shown that the dynamic stiffness of the end-bearing pile depends on the pile's slenderness ratio, soil property and excitation frequency. The results presented are useful in pile design.

Keywords: Timoshenko model, end-bearing pile, interaction between pile and soil, dynamic stiffness, horizontal vibration

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