

砂土地层中桩基受力特征试验分析

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IN-SITU TEST AND ANALYSIS ON MECHANICAL CHARACTERISTICS OF PILES IN SANDS

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摘要 我国长江中下游沿岸地基中分布有较厚的砂土层,砂土层是桩基的良好持力层。该地区砂性土埋藏浅,厚度大,往往夹杂粉土或粉质黏土,一般随深度增大,砂土变密实。已有研究成果中,针对桩身穿过多层砂土条件下桩基承载力的研究较少。砂土地基中打入桩试验结果表明,砂性土的状态对打入式预制桩的施工产生很大的影响,在松散或稍密的砂性土中沉桩一般比较容易,而在中密或密实的砂性土中则较为困难。本文通过某电厂工程灌注桩现场静载试验,研究了砂土地基中桩身沉降随荷载变化规律,分析了桩身轴力随地层深度变化特征及不同土层的桩侧摩阻力。设计钻孔灌注桩桩径为800mm,桩长为47.2m,桩身混凝土强度等级为C35,桩身穿过9层土层,由现场3根桩静载试验结果可知,荷载与沉降关系呈非线性, Q - s 曲线分为弹性阶段、弹塑性阶段和整体破坏3个阶段,15m深度以下的粉细砂层侧摩阻力对桩身轴力影响较大,15m以上粉质黏土和淤泥质土对桩轴力影响较小。根据 Q - s 曲线确定单桩极限荷载约为4800~5400kN,平均值为5201kN,可满足设计要求,地基中下部砂土层承载力较大,砂土侧摩阻力大于黏性土的侧摩阻力,最大可达到70kPa。所得结论可为该类地基进一步的理论研究及工程设计提供有益的参考。

关键词: 砂土 桩基 静载试验 桩侧摩擦阻力

Abstract: Large number of engineering practice shows that there are thick sand layers in the foundation along the middle and lower reaches of the Yangtze River, China. The sand layers are good bearing stratum for pile foundations. In the area, the sands are at shallow depths, have big thicknesses, and include silt and silt clay. As the depth increases, the sands become dense. The experimental results of the driven piles indicate that the status of the density of sands has great influence on the construction of the performed piles. The pile-driving operation is easier in the loose or slightly dense sands than in the medium or very dense sands. In this paper, large scale static load tests are carried out for three piles of a power station. The characteristics of the pile settlement with load variation are studied. The axial force and side resistance of the piles are calculated at the same time. The designed diameter of the three piles is 800mm, and their length is 47.2m. The grade of the concrete is C35. Nine soil layers are passed through by the pile body. The results of static loading tests indicate that the relation of the load(Q) and settlement(s) is nonlinear. The Q - s curves can be divided into three stages including the elastic, elastic-plastic and overall damage. The frictional resistance of the sands under 15m depth is much bigger than the silt clay or the muddy soil. The results indicate that the bearing capacities of the piles are all more than 4800kN. It will be provided as reference for future design and research.

Key words: Sands Pile foundation Static load test Pile side resistance

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