

动三轴试验中饱和软黏土的孔压特性及其对有效应力路径的影响

王 军¹, 谷 川^{1, 2}, 蔡袁强^{1, 2}, 杨 芳^{1*}

(1. 温州大学 建筑与土木工程学院, 浙江 温州 325035; 2. 浙江大学 软弱土与环境土工教育部重点实验室, 浙江 杭州 310027)

BEHAVIOR OF PORE WATER PRESSURE IN DYNAMIC TRIAXIAL TESTS OF SATURATED SOFT CLAY AND ITS EFFECT ON EFFECTIVE STRESS PATH

WANG Jun¹, GU Chuan^{1, 2}, CAI Yuanqiang^{1, 2}, YANG Fang^{1*}

(1. College of Architecture and Civil Engineering, Wenzhou University, Wenzhou, Zhejiang 325035, China; 2. Key Laboratory of Soft Soils and Geoenvironmental Engineering of Ministry of Education, Zhejiang University, Hangzhou, Zhejiang 310027, China)

摘要

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摘要 变围压动三轴试验能够同时施加循环变化的偏应力与循环变化的围压, 可以模拟地震荷载下动剪应力与动正应力的耦合。通过GDS双向动三轴设备进行一系列饱和软黏土的变围压动三轴试验, 系统研究循环偏应力和循环围压耦合对饱和软黏土孔压特性的影响。试验结果表明: 在单纯循环围压条件下, 饱和软黏土会产生相应的正的瞬时动孔压, 但是并没有产生明显的负的瞬时动孔压; 在循环偏应力与循环围压耦合情况下, 饱和软黏土的孔压时程曲线表现出与常规动三轴试验不同的特性, 即动孔压的振幅更大, 并且最大动孔压和最小动孔压表现出不同的发展规律: 最大动孔压持续增长, 而最小动孔压在加载一定周数后趋于稳定。此外, 对残余孔压的定义进行量化, 并对循环偏应力和循环围压耦合对有效应力路径的影响进行研究。

关键词: 土力学 应力路径 孔压 动三轴试验 有效应力路径

Abstract: The dynamic triaxial test with cyclic confining pressure can apply cyclic confining pressure in addition to the cyclic deviatoric stress, and it can simulate the coupling of cyclic shear stress and cyclic normal stress in earthquakes. The influence of the coupling of cyclic deviatoric stress and cyclic confining pressure on the development of pore water pressure is studied using an advanced global digital systems(GDS) dynamic triaxial device. Test results show that: in pure cyclic confining pressure tests, the cyclic confining pressure can develop the corresponding positive pore water pressure, but cannot develop the corresponding negative pore water pressure; the coupling of cyclic confining pressure and cyclic deviatoric stress makes great influence on the behavior of pore water pressures, the amplitudes of pore water pressures increase greatly in comparison with the conventional dynamic triaxial tests; and the developments of maximum and minimum pore water pressure show different behaviors; and the maximum dynamic pore water pressure continues to grow, while the minimum dynamic pore water pressure stabilizes after a certain number of weeks under loading. Moreover, the residual pore water pressure is defined and the influence of the coupling of cyclic deviatoric stress and cyclic confining pressure on the behavior of effective stress paths is studied.

Keywords: soil mechanics stress path pore water pressure dynamic triaxial test effective stress path

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