饱和土体固结变形特征的一种非线性描述

白 冰

(北京交通大学 土木建筑工程学院，北京 100044)

摘要 基于非线性假定的固结方程及其标准化形式，给出一个描述饱和土体非线性固结变形特征的实用的理论模型。在假定孔隙比与有效应力关系的基础上，研究土层固结度随时间因素的演化过程，进而分析饱和土体固结变形的内在规律性，指出其与经典 Terzaghi 渗透固结变形理论的差异。其中，定义了一个表征土体非线性特征的重要参量 l，分析该参数的大小以及土层厚度的影响，从而较好地解释和描述不同厚度土层(或不同的排水条件)固结形态的差异性。利用理论分析结果，对一些典型试验结果进行对照分析，说明上述理论的合理性。

关键词   土力学；饱和土体；非线性固结；线性化参数；时间因素
分类号

A MODEL FOR DESCRIBING THE NONLINEAR CONSOLIDATION CHARACTERISTICS OF SATURATED SOFT SOIL

BAI Bing

(School of Civil Engineering and Architecture，Beijing Jiaotong University，Beijing 100044，China)

Abstract
 Based on the nonlinear governing equation for one-dimensional primary consolidation and its dimensionless forms，an analytical consolidation theory of saturated soft soils is deduced. The relationship between void ratio and effective stress is assumed by previous studies. By using the initial and boundary conditions，the analytical expressions of normalized void ratio of normally consolidated saturated soils for uniform surcharge loading and two-way drainage are presented. The degrees of consolidation are also given in a normalized form. The consolidation deformation characteristics of saturated soft soils are analyzed；and the difference between the proposed theory and Terzaghi¢s consolidation theory is pointed out. In order to express the nonlinear consolidation characteristics，a new parameter called nonlinear parameter l is defined，and the effects of l and thickness of soil layer h are analyzed. The comparisons between calculation results and some typical test results show that the proposed model can be well used to describe the consolidation characteristics of saturated soils. The studies show that there is an obvious difference in the characteristics of consolidation deformation with the changes of thickness of soil layer；and these differences are mainly induced by the nonlinear characteristics of soils instead of simply by secondary deformation effect among the primary consolidation process.
Key words soil mechanics；saturated soils；nonlinear consolidation；linearization parameter；time factor

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