

边坡工程地质稳定性研究

稳定渗流条件下土坡稳定性分析的一种新方法

邓东平, 李亮, 赵炼恒

中南大学土木建筑学院 长沙 410075

摘要:

在提出随机角生成曲线滑动面方法的基础上,通过改变选定参数来搜索临界滑动面,对渗流作用下的不同土质边坡进行稳定性分析。考虑渗流效应时,将土体视为三种土条划分情况,并进行受力分析,推导出简化Janbu法中土条的浮力和渗透力计算公式。同时,对实际渗流场做出合理简化,以便应用于计算机编程。算例对比分析表明:①此方法计算出的最小安全系数与已有研究成果非常接近,得到的最危险滑动面也颇为相似,可证明本文方法的正确性;②以非圆弧滑动面与圆弧滑动面计算出的最小安全系数相比,前者明显要小,建议在有渗流作用时应采用非圆弧滑动面;③对两个不同水位下的均质土坡,以水位与坡高之比为参数对边坡状态进行分析时,结果表明随着地下水位的升高,边坡安全系数急剧下降,因而,渗流效应是边坡发生失稳的一个重要因素,工程实际中应特别注意边坡排水设施的设置。

关键词: 边坡稳定性分析 滑动面搜索 渗流作用 简化Janbu法 安全系数

A NEW METHOD FOR ANALYSIS OF SLOPE STABILITY UNDER STEADY SEEPAGE

DENG Dongping, LI Liang, ZHAO Lianheng

College of Civil and Architectural Engineering, Central South University, Changsha 410075

Abstract:

This paper is based on the method of random angle generating curve sliding surface. It analyses the stability of slopes comprising different soils under the action of seepage. It changes the value of the selected parameters to search for critical sliding surface. When considering the effect of seepage, the slope soil is modelled as three situations of slice divisions. Mechanical analysis is conducted to derive the formula of buoyancy and penetration of slices in simplified Janbu method. At the same time, in order to apply to computer programming, it made a reasonable simplification for the actual flow field. Through cooperating and analysing examples, it shows that both the minimum factor of safety and the most critical sliding surface obtained by this method are very close or quite similar to the results of the existing methods, which shows the correctness of this method. Secondly, the minimum factor of safety calculated by using non-circular sliding surface method is significantly smaller than that by using circular sliding surface method, which recommends that the non-circular sliding surface method be adopted under action of seepage. Thirdly it analyses the state of slopes by using ratio of height of water level and height of slope as the parameter for two homogeneous slopes under different water levels. The results show that with increase of groundwater level, factor of safety of slopes was sharply declined. So effect of seepage is an important factor for occurring of slope instability. Setting of drainage facilities on slopes should be paid special attention in engineering practice.

Keywords: Slope stability Search of sliding surface Seepage Simplified Janbu method Factor of safety

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通讯作者:

作者简介: 邓东平,主要从事道路与铁道工程方面的研究.Email: dengdp851112@126.com

作者Email:

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