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关于有限元边坡稳定性分析中安全系数的定义问题

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摘要 在边坡稳定性分析的极限平衡法中存在3种安全系数的定义: 定义1将安全系数定义为剪切强度比剪应力; 定义2将安全系数定义为强度储备系数, 当土体抗剪强度除以安全系数后, 边坡将处于临界平衡状态; 定义3将安全系数定义为沿某一特定滑面的抗滑力比滑动力。讨论了定义3与定义1之间的关系, 给出了在进行有限元边坡稳定性分析时确定对应于定义3和定义2的临界滑面的统一算法, 最后通过算例证明了一般情况下基于定义3所求得的安全系数和临界滑面不同于基于定义2所求得的结果, 同时指出基于定义3的计算结果会表现出一些不合理的现象。

关键词 [数值分析; 边坡稳定性分析; 安全系数; 有限元](#)

分类号

ON DEFINITIONS OF SAFETY FACTOR OF SLOPE STABILITY ANALYSIS WITH FINITE ELEMENT METHOD

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Abstract

There exist three definitions of safety factor in slope stability analyses by limit equilibrium methods (LEM). Definition 1 defines the safety factor as the ratio of the shear strength of soil to the shear stress required for equilibrium. Definition 2 defines the margin of safety factor as the factor of the strength reduction, by which the shear strength of the soil would have to be divided to bring the slope into a state of critical equilibrium. Definition 3 defines the safety factor as the ratio of the resistant shear force to the driving shear force along a certain slip surface. This study discusses the relation between Definition 1 and 3. A unified algorithm is given, which is used to locate the critical slip lines corresponding to Definition 3 and Definition 2 respectively. It is also proved while the finite element method is used to analyze slope stability, both the safety factor and the potential slip surface based on Definition 3 are different from those on Definition 2. Some irrational results might be obtained if Definition 3 is used in finite element slope stability analysis.

Key words [numerical analysis; slope stability analysis; safety factor; finite element method\(FEM\)](#)

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