预应力锚索加固土质边坡极限平衡稳定性分析

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LIMIT EQUILIBRIUM ANALYSIS ON STABILITY OF SOIL SLOPES REINFORCED WITH PRE-TENSIONED CABLES

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摘要 基于滑动面搜索新方法,对预应力锚索加固边坡进行稳定性分析。通过将锚索的加固效应简化为作用在土条(柱)底面上的一个外力,实现了条分(柱)法下二维和三维锚索加固边坡的安全系数计算。经过算例对比分析,验证了本文方法的可行性,然后,在一定程度上研究了锚索倾角 θ、三维滑动体长度 L、锚索锚固力 F 以及水平加固间距 S 变化时对边坡稳定性的影响。研究结果表明:(1)锚索加固可有效提高边坡的稳定性,同时,也增大了原有边坡发生滑动的范围;(2)随着三维滑动体长度 L 的增大,三维边坡(包括未加固和锚索加固)的稳定性趋于二维边坡稳定性;(3)单位水平加固间距上的锚索锚固力越大,锚索对边坡的加固效应越明显。

关键词: 边坡工程   二维和三维滑动面   预应力锚索   安全系数

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Abstract: This paper presents a new method of searching for sliding surface and uses it for stability analysis of slopes reinforced with pre-tensioned cables. The reinforcement effect of cables is simplified to an external force on the bottom surface of the soil section(column) when the slice methods are used. The formula for calculating the factor of safety(FOS) is achieved in two-dimensional(2D)or three-dimensional(3D)slopes reinforced with pre-tensioned cables. Some examples are compared and analyzed. The feasibility of the proposed method is verified. Then in a certain extent, the effect on the slope stability with change of cable angle(θ),length of three-dimensional sliding body(L),anchorage force of cable(F) and horizontal space of reinforcement cable(S) is researched. The numerical results show the follows.(1)Cables can effectively improve the stability of slope, and can increase the range of original slope's sliding surface.(2)As the three-dimension sliding body length(L) increases, the stability of 3D slopes(including non-reinforcement slope and slopes reinforced with cables) tends to the stability of 2D slopes.(3)the greater anchorage force of per meter horizontal reinforcement spacing is,the more anchor cable's reinforcement effect on the slope is.

Key words: Slope engineering   Two-dimensional and three-dimensional sliding surface   Pre-tensioned cable   Factor of safety(FOS)

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