

Comparison between Deterministic and Probabilistic Stability Analysis, Featuring Consequent Risk Assessment

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Abstract : Slope stability analyses are largely carried out by deterministic methods and evaluated through a single security factor. Although it is known that the geotechnical parameters can present great dispersal, such analyses are considered fixed and known. The probabilistic methods, in turn, incorporate the variability of input key parameters (random variables), resulting in a range of values of safety factors, thus enabling the determination of the probability of failure, which is an essential parameter in the calculation of the risk (probability multiplied by the consequence of the event). Among the probabilistic methods, there are three frequently used methods in geotechnical society: FOSM (First-Order, Second-Moment), Rosenblueth (Point Estimates) and Monte Carlo. This paper presents a comparison between the results from deterministic and probabilistic analyses (FOSM method, Monte Carlo and Rosenblueth) applied to a hypothetical slope. The end was held to evaluate the behavior of the slope and consequent risk analysis, which is used to calculate the risk and analyze their mitigation and control solutions. It can be observed that the results obtained by the three probabilistic methods were quite close. It should be noticed that the calculation of the risk makes it possible to list the priority to the implementation of mitigation measures. Therefore, it is recommended to do a good assessment of the geological-geotechnical model incorporating the uncertainty in viability, design, construction, operation and closure by means of risk management.

Keywords : probabilistic methods, risk assessment, risk management, slope stability

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