Master Thesis

Topic:

Reliability analysis of slopes in open cast mines using a combination of the limit equilibrium and finite element methods

Description:

In a current research project a new generalized procedure for assessing the stability of permanent final slopes of open cast mines in Bavaria is developed. The project faces the challenge of determining the stability of slopes, which are a by-product of the mining activity and not an engineering structure. Often these slopes are at an uncertain state close to or at the limit equilibrium, and their stability and performance are hard to judge relying on standardized engineering approaches.

A promising approach is to judge these slopes by applying probabilistic methods to determine the reliability (or probability of failure) rather than the factor of safety. With these methods, the inherent variability of the shear strength parameters of the soil can be included into the analysis. Through this approach, the criticality of the slope can be assessed.

Scope of work:

1. Analysis of an existing slope in a sand pit in northern Bavaria, with a factor of safety below one according to the Ultimate Limit State analysis with DIN4084.
2. Back calculation of the shear strength of the slope based on soil type and geometry by applying the Limit Equilibrium and Finite Element method.
3. Comparison to results from laboratory tests.
4. Definition of a probability distribution of the shear strength parameters φ' and c' on the basis of values of experience and laboratory tests.
5. Application of the First Order Reliability Method (FORM) together with the Limit Equilibrium Method (LEM) for determination of the Design Point of the slope based on the probability distributions of shear strength parameters.
6. Finite Element Analysis (φ' / c' – reduction) of the slope based on the determined Design Point for determination of the failure mode and the corresponding Model Correction Factor.
7. Recalculation of the Design Point and probability of failure approximation using FORM + LEM by applying the Model Correction Factor method.

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Special requirements and comments:
Prior attendance of courses of the master studies in geotechnical engineering and risk analysis are mandatory.

The Master Thesis will be supervised by Zentrum Geotechnik together with the Engineering Risk Analysis Group.

Themenstellung am:

Ausgegeben an:

Ausgegeben am:

Supervisor:
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