

Master thesis (MT, 30 ECTS)

Working title Consideration of uncertainties in determination of rock mass-, excavation- and support classes in tunnelling – Effects on the tendering and on the cost- and time calculation

Description

In all phases of a civil engineering construction project, engineers have to deal with uncertainties of different kinds. Such uncertainties can be related for example to delays of construction material deliveries, to unexpected difficulties during construction, to the training period of construction workers or to unfavourable weather conditions; just to name a few. The owner/client is supposed to identify and consider most important uncertainties to be able to evaluate the (financial/technical) feasibility of the project and to provide bidders a reliable basis for the preparation of their offers. On the other hand, the bidders and, later, the contractors should take uncertainties into account to reduce their personal economic risks they take as soon as they submit an offer.

Compared to structural engineering, in tunnelling even more uncertainties arise due to the lack of knowledge of the physical conditions underground. Except from the properties of the construction material used in tunnelling, the engineers know little about the rock mass they have to head through and about the boundary conditions they have to deal with (e.g. primary stress state). In Austria, time- and cost-calculations for tunnelling projects base on the rock mass characterisation according to the *Guideline for the Geotechnical Design of Underground Structures with Conventional Excavation* published by the Austrian Society for Geomechanics and on the *Works Contracts for Underground Works* published by the Austrian Standards Institute. In the latter, the determination of so-called Tunnelling Classes is explained and the consideration of uncertainties at such should be focused on in the thesis.

The student should complete following tasks:

- Literature study: "How are uncertainties considered for the tendering and bidding in structural engineering?" (state of the art)
- Literature study: "How are uncertainties considered for the tendering and bidding in underground engineering?" (state of the art)
- Identify differences between the approach in structural engineering and the approach in underground engineering
- Identify shortcomings in the approach in underground engineering and develop possible ways/methods to overcome these shortcomings considering boundary conditions given by (Austrian) standards
- Presentation of developed methods to experts
- Apply revised developed methods to a fictitious tunnel project to show differences between "old" and "new" (adopted) approach
- Preliminary- and final presentation and written report (master thesis)

Depending on the working load the thesis will be split into several theses. The thesis can be combined with a master project (preliminary study).

Requirements Passion for risk assessment (e.g. Monte-Carlo simulation), time- and cost calculations; Ability to establish complex data sheets and evaluation diagrams; Interest to work and discuss with several engineers

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Start Immediately / by agreement

Duration approx. 6 months

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