

Numerical simulation of slope stabilization by using high tensile steel wire meshes

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Abstract. Due to weathering of rock as well as natural forces, e.g. heavy rainfall, many slopes along railway tracks or roads are not long-term stable. Failure of slope or rock falls risk life and limb. Furthermore, economic damage can be high, e.g. due to railway track closure.

Soil nailing combined with a flexible facing made from steel wire meshes is a sustainable method for slope protection. It is already a commonly used and economically efficient structural system for slope stabilization. Soil nails reinforce the natural soil, which strongly decreases earthwork compared to other retaining and supporting systems. The steel wire mesh ensures the transmission of force and guarantees the safety against local and global slope failure. Deformations are minimized by using high tensile steel wire meshes.

Against this background, the aim of the paper is to develop a simplified but accurate designing approach for slope stabilization systems with steel wire meshes. For this, full scale in situ tests were conducted. Among others, different flexible facing systems, nail arrangements and soil conditions were investigated. The flexible slope stabilization system and the soil were installed in a large box. After the installation, the test box was lifted up stepwise using a crane. Different parameters like three dimensional deformation, rope forces as well as the moment and normal forces in nails were measured. Test results are used for a numerical back analysis with three dimensional finite element method. The numerical simulation will be used to determine the impact of soil properties, nailing geometry and facing system. These investigations could improve the understanding of load bearing and deformation behavior.

Keywords: slope stabilization, slope protection, soil nailing, steel wire mesh, flexible facing, numerical modelling.