

RESEARCH PROJECT TACR

DEVELOPMENT AND APPLICATION OF NUMERICAL METHODS FOR TUNNEL SAFETY ENHANCEMENT



Project designation: TA01031840

Supplier: Technology Agency of the Czech Republic (TACR)  Technologická agentura České republiky

Period: 2011 – 2013

Recipient (leader): 3G Consulting Engineers s.r.o. (doc. Ing. Matouš Hilar, Ph.D.)

Co-recipient (co-leader): Charles University in Prague (RNDr. David Mašín, M.Phil., Ph.D.)

Project description:

Research in numerical modeling of tunnels in fine grained soils has clearly proven that crucial part of any numerical simulation is appropriate constitutive (material) model. Probably the most important feature of soil behaviour, which needs to be considered and which is not taken into account by simple constitutive models currently used in the engineering practice, is the non-linear decrease of the soil stiffness with the deformation. One of the theories to simulate nonlinear behavior is based on hypoplasticity.

The research project is dealing with modification of existing hypoplastic models with focus on fine grained soil stiffness anisotropy implementation. The target is to improve predictions of underground excavations, tunnels, deep foundation, slope stability etc. behavior. Another task of the project is the evaluation of model initial conditions (especially determination of an earth pressure at a rest ratio K_0 , which significantly influences predictions), practical application and calibration of material parameters. The next step is implementation of developed hypoplastic model into finite element programs with emphasis to software Plaxis, probably the most widely used FE program in czech and international geotechnical practice. The new model will be used for evaluation of existing field experiments focused on determination of earth pressure at a rest K_0 and numerical simulations of underground constructions realized with reference hypoplastic model.

