Experiences of deep geological radioactive waste repository project in Hungary

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The first underground radioactive waste repository for low and intermediate level waste in Hungary is being built in the outskirts of the village of Bátaapáti. The total length of tunnels driven to date is over 5,200 m including two inclined access tunnels, the base tunnels and the first emplacement chambers. The tunnels were driven in fractured granitic rocks. The first emplacement chamber is already filled with radioactive waste and other chambers are under construction or under design. Furthermore, the investigation for the high level radioactive waste repository site is under progress. It is planned to construct in BAF (Boda Aleurite Formation) which is a very compacted and cemented claystone.

The Department of Engineering Geology and Geotechnics is taking part the investigation of the host rocks of the sites, both the granite and the BAF formation. Several BSc, MSc and a PhD thesis was written about this topic. At the construction site detailed monitoring measurements have been done (Kovács et al. 2012) (convergence, 1D, 3D stress measurements, detailed rock mass classifications according to RMR, Q and GSI methods), which results allow to investigate the behaviour of granitic rock masses during tunnel construction.

According to the measured data computer modelling had been done to describe some details of the behaviour of the host rock during the construction (Horváth et al. 2012, Borbély et al. 2014a, 2015), and the long term behaviour of the tunnel was also investigated (Borbély et al. 2014b). Based on the discontinuities the host rock of the repository can be considered as an assembly of blocks, therefore the discrete element modelling approach can be used to provide representative results of its behaviour. Near the hybrid finite elements models, hybrid continuum-discrete model had been done also to describe the blocky nature of the granitic rock masses with the 3DEC software (Borbély et al. 2015). The results of the monitoring system offer the ability to check the validity of the results of the computer models. The effect of the uncertainty in the input parameters of the computer models was also investigated by Vince et al. (2014).

Special laboratory analysis also had been performed at the accredited Engineering Geological Laboratory of the department, which included shear strength tests of discontinuities as well (Buocz et al. 2010, 2014). New method was developed for fracture surface roughness testing from the Bátaapáti National Radioactive Waste Repository project. During the calibration of modelling and design work it was necessary to develop a simple and quantitative approach to predict the Joint Roughness Coefficient (JRC) value of fracture surfaces. To reach this goal laboratory-scale and on-site large scale surfaces were investigated (Krupa et al. 2013).

Keywords: radioactive waste disposal, granitic rock mass, blocky rock mass, monitoring, FEM, DEM, laboratory analysis

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