



**ACADEMIC YEAR 2009 – 2010**

**TITLE OF DIPLOMA THESIS:**

Risk analysis on interaction of tunnels and constructions

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**ABSTRACT**

The diploma essay in question realizes a risk analysis on the construction of a tunnel and its interaction with neighbouring, above ground constructions. The need for the realization of this analysis derives from the fact that the precision of the prediction of the geotechnical works' behaviour is generally limited and the used factors of safety have been chosen empirically, resulting in a frequent non-correspondence to current conditions. The study being realized is based on the use of a stochastic model which describes the variability of the soil parameters. This model is applied to the study of the effect of a tunnel cutting on the calculation of the ground movements around an existing construction. Hence, a simplified probabilistic analysis is presented as it can be applied for tunnel studies. The geotechnical parameters, which affect mostly the calculations, are found and considered as random variables of normal distribution with known mean value and standard deviation. For the calculation of the soil movements eight analysis of the model are being tested on the Plaxis program for different values of the modulus of elasticity of the soil layers. The results that come up are used in combination with the approximating method analysis Point Estimate so as to estimate the distribution features of specific tunnel responses to realize the reliability analysis of the construction. The cases being studied are these where the stochastic parameters are either utterly irrelevant to one another or have an 80% relevance, while a comparison of the results is being made. Through the reliability analysis, the probability of failure in the construction is being determined, providing deductions as to the possibility of exceeding the limits of acceptable behaviour during the construction. For its calculation, the method of the reliability index  $\beta$  has been used. In conclusion, the necessity of the reliability analysis is being proved in order to achieve a more economic and precise design of a construction, because, with the diagrams that come up, it offers, on the one hand, the two-way correlation of the probability of failure  $P_f$  with the limit of tunnel responses. On the other hand, it leads to a more rational choice of the safety factor. Moreover, it is deducted that the calculations can be achieved by accepting the irrelevance of the uncertain parameters without any loss of precision, since the variations in the results fluctuate around 0,2 - 0,4%.

**KEYWORDS**

Tunnel, Reliability analysis, Probability of failure