



IAEG C 28 - Reliability quantification of the geological model in large civil engineering projects

Literature

The Italian group of the IAEG started in September 2007 the works of a national technical commission on this topic. According to the discussion undertaken by Italian group a guideline as been published (see http://www.iaeg.it/comm_opere_sott.htm), adopted as first input document of C28.

From this guideline the following relevant literature is taken:

- AFTES GT32 (2004). *Prise en compte des risques géotechniques dans le dossiers de consultation des entreprises pour les projets de tunnel. Tunnels et Ouvrages Souterrains*, n.185, pp. 316-327.
- Baecher G. B., Christian J. T. (2003). *Reliability and statistics in geotechnical engineering*. J. Wiley & Sons, London.
- Bianchi, G.W., Perello, P., Venturini, G., Dematteis, A., Delle Piane, L and Damiano, A. 2006. Determination of reliability in geological forecasts for tunnel projects: the method of the R-index and its application. XIth International Congress for Mathematical Geology in Liege, 3-8 September, 2006.
- Bistacchi A., Massironi M., Dal Piaz G.V., Dal Piaz G., Monopoli B., Schiavo A., Toffolon G. 2008. 3D fold and fault reconstruction with an uncertainty model: An example from an Alpine tunnel case study. *Computers & Geosciences* 34 2008, 351–372.
- Cetin KO, Seed R.B., Der Kiureghian A., Tokimatsu K., Harder L.F., Kayen R.E., Moss R.E.S. (2004) Standard penetration test-based probabilistic and deterministic assessment of seismic soil liquefaction potential. *J Geotech Geoenviron Eng*;130(12),1314–340.
- National Council of researches. Committee for Geological and Mining sciences (1997). *Strategic tunnelling report – Final report*. National coordinator Prof. Eng. Sebastiano Pelizza.
- Dematteis, A., Mancari, G., Marini, M., 2007. Reliability assessment in geological forecasts for an highway tunnel: the application of the R-index method in sedimentary rocks. *Proc. FIST GEOITALIA 2007*, Rimini 12-14 September 2007, 8 pp.
- Demougeot-Renard, Chantal de Fouquet, and Philippe Renard (2004) Forecasting the Number of Soil Samples Required to Reduce Remediation Cost Uncertainty. *Journal of Environmental Quality* 33, 1694-1702.

- Duncan M. (2000) Factors of safety and reliability in geotechnical engineering. *Journal of Geotechnical and Geoenvironmental Engineering* 126/4, 307-316.
- Essex R.J., 1997. *Geotechnical Baseline Reports for Underground Construction. Guidelines and practices*. Technical Committee on Geotechnical Reports of the Underground Technology Research Council (sponsored by the Construction Division of the American Society of Civil Engineers and the American Institute of Mining, Metallurgical and Petroleum Engineers). ASCE, 51 pp.
- Gill D. E., Corthésy R., Leite M. H. (2005) A statistical approach for determining practical rock strength and deformability values from laboratory tests. *Engineering Geology* 78, 53–67
- Gill D. E., Corthésy R., Leite M. H. (2005) Determining the minimal number of specimens for laboratory testing of rock properties. *Engineering Geology* 78, 29–51
- Grasso P., D. Collomb, P. Vignat, A. Bochon (2002). Base Tunnel Maurienne-Ambin: Probabilistic Estimation of Construction Time and Cost for Various Project Planning and Configuration Alternatives Considering Geologic and Geomechanical Uncertainties. *Atti del Convegno su Le indagini Geologiche e Geotecniche Propedeutiche alla Costruzione delle Opere Sotterranee sia Civili che Minerarie*, Modena.
- Isaksson T., Stille H. (2005). Model for estimation of time and cost for tunnel projects based on risk evaluation. *Rock Mech. Rock Engng.*, pp. 373-398.
- ITA - International Tunnelling Association, Working Group no. 17 (April 2003, updated July 2003) on Long Tunnels at Great Depth. Final Draft of the WG report reviewed after the WG 17. Meeting in Amsterdam – Long Traffic Tunnels at Great Depth.
- ITA - International Tunnelling Association, Working Group no. 2 (2004) Guidelines for tunnelling risk management. *Tunnelling and Underground Space Technology*, 19, pp. 217-237.
- ITIG - International Tunnelling Insurance Group, 2006. The Joint Code of Practice for Risk Management of Tunnel Works
- Lajaunie C., Courrioux G. and Manuel L. (1997) Foliation Fields and 3D Cartography in Geology: Principles of a Method Based on Potential Interpolation. *Mathematical Geology*, 29/4, 571-584
- Mallet J.L. (1997) Discrete modelling for Natural Objects. *Mathematical Geology* 29/2, 199-219.
- Miranda T., Gomes Correia A. and Ribeiro e Sousa L. (2009) Bayesian methodology for updating geomechanical parameters and uncertainty quantification. *International Journal of Rock Mechanics and Mining Sciences* 46/7, 1144-1153
- Nenad Pavlovic (2006). Geotechnical zonation. Principles, criteria and procedure. Safety in the underground space, AITES-ITA World Tunnel Congress, Seoul, Corea.
- Perello, P., Venturini, G., Delle Piane, L., Dematteis, A. 2007. Ground water inflows in tunnels excavated in faulted rock mass. *Felsbau*, vol 4, pp 28-34
- Perello P., Venturini G., Dematteis A., Bianchi G.W., Delle Piane L., Damiano A. 2005. Determination of reliability in geological forecasting for linear underground structures: the method of the R-index. *Geoline 2005*, Lyon, France.

- Pine R.J., Roberds W.J. (2005) A risk-based approach for the design of rock slopes subject to multiple failure modes—illustrated by a case study in Hong Kong. *International Journal of Rock Mechanics & Mining Sciences* 42, 261–275.
- Pomian-Srzednicki, I. (2001) Calculation of geological uncertainties associated with 3-D geological models. These Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland, 101pp.
- Ruffolo R. M., Shakoor A. (2009) Variability of unconfined compressive strength in relation to number of test samples. *Engineering Geology* 108, 16–23
- Sari M. (2009) The stochastic assessment of strength and deformability characteristics for a pyroclastic rock mass. *International Journal of Rock Mechanics & Mining Sciences* 46, 613–626
- Subcommittee on Geotechnical Site Investigations. U.S. National Committee on Tunneling Technology. Commission on Engineering and Technical Systems. National Research Council (1984). *Geotechnical Site Investigations for Underground Projects*. Washington D.C., National Academy Press.
- Tonini A., Guastaldi E., Massa G., Conti P. (2008) 3D geo-mapping based on surface data for preliminary study of underground works: A case study in Val Topina (Central Italy). *Engineering Geology* 99, 61–69
- Underground Technology Research Council (1996). *UTRC Forum on Geotechnical Reports in underground construction. The perspective of engineering firms*.
- van Staveren M.Th. and Knoeff J.G., 2004. The Geotechnical Baseline Report as Risk Allocation Tool. R. Hack, R. Azzam, R. Charlier (Eds.): *LNES 104*, pp. 777–785, 2004.
- van Staveren M.Th. and Peters T.J.M., 2004. Matching Monitoring, Risk Allocation and Geotechnical Baseline Reports. R. Hack, R. Azzam, R. Charlier (Eds.): *LNES 104*, pp. 786–791, 2004.
- Venturini, G., Damiano, A., Dematteis, A., Delle Piane, L., Fontan, D., Martinotti, G., Perello, P. 2001. The importance of dependability of a Reference Geological Model in tunneling studies. *Geoitalia 2001 3d Italian Forum for Earth's sciences* – FIST, Chieti, 5-8 September, pp. 426-427.