

NUMERICAL ANALYSIS OF A TUNNEL IN RESIDUAL SOILS

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Abstract: This paper presents results of an elastoplastic finite element back analysis of a shallow tunnel through residual soils. The tunnel was constructed as part of the expansion of the underground transit system in the city of São Paulo, Brazil. A comprehensive laboratory testing program on undisturbed soil samples was performed in order to characterize the stress–strain–strength behavior of the residual soils. Results from this laboratory testing program were used to calibrate a nonassociated elastoplastic constitutive model utilized to reproduce the behavior of the residual soils under stress paths typical of underground excavation. A stress transfer method is proposed to simulate, using a two-dimensional finite element analysis, the response of the soil mass to the three-dimensional advancement of a tunnel excavation. Comparisons are presented between monitored displacements from an instrumented section of the Parai'iso tunnel, empirical predictions, and the results of a finite element back analysis. Good agreement is achieved between the displacements obtained from field instrumentation data and the empirical and numerical results.

Full reference:

Azevedo, R.F., Parreira, A.B., and Zornberg, J.G. (2002). "Numerical Analysis of a Tunnel in Residual Soils." *Journal of Geotechnical and Geoenvironmental Engineering*, ASCE, Vol. 128, No. 3, pp. 227-236.

Link to file*:

[http://dx.doi.org/10.1061/\(ASCE\)1090-0241\(2002\)128:3\(227\)](http://dx.doi.org/10.1061/(ASCE)1090-0241(2002)128:3(227))

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