



Slope Stability Evaluations by Limit Equilibrium and Finite Element Methods Applied to a Railway in the Moroccan Rif

PDF (Size: 1661KB) PP. 27-32 DOI: 10.4236/ojce.2012.21005

Author(s)

Khadija Baba, Lahcen Bahi, Latifa Ouadif, Ahmed Akhssas

ABSTRACT

Since 1930, the analysis of slope stability is done according to the limit equilibrium approach. Several methods were developed of which certain remain applicable because of their simplicity. However, major disadvantages of these methods are (1) they do not take into account the soil behavior and (2) the complex cases cannot be studied with precision. The use of the finite elements in calculations of stability has to overcome the weakness of the traditional methods. An analysis of stability was applied to a slope, of complex geometry, composed of alternating sandstone and marls using finite elements and limit equilibrium methods. The calculation of the safety factors did not note any significant difference between the two approaches. Various calculations carried out illustrate perfectly benefits that can be gained from modeling the behavior by the finite elements method. In the finite elements analysis, the shape of deformations localization in the slope is nearly circular and confirms the shape of the failure line which constitutes the basic assumption of the analytical methods. The integration of the constitutive laws of soils and the use of field' s results tests in finite elements models predict the failure mode, to better approach the real behavior of slope soil formations and to optimize its reinforcement.

KEYWORDS

Conventional Methods; Finite Elements; Safety Factor; Slopes Stability

Cite this paper

K. Baba, L. Bahi, L. Ouadif and A. Akhssas, "Slope Stability Evaluations by Limit Equilibrium and Finite Element Methods Applied to a Railway in the Moroccan Rif," *Open Journal of Civil Engineering*, Vol. 2 No. 1, 2012, pp. 27-32. doi: 10.4236/ojce.2012.21005.

References

- [1] J. M. Duncan, " State of the Art: Limit Equilibrium and Finite-Element Analysis of Slopes," Journal of Geotechnical Engineering, Vol. 122, No. 7, 1996, pp. 577-596. doi:10.1061/(ASCE)0733-9410(1996)122:7(577)
- [2] W. Fellenius, " Erdstatische Berechnungen mit Reibung und Kohasion," Ernst, Berlin, 1927.
- [3] A. W. Bishop, " The Use of the Slip Circle in the Stability Analysis of Slopes," Géotechnique, Vol. 5, No. 1, 1955, pp. 7-17. doi:10.1680/geot.1955.5.1.7
- [4] J. M. Duncan, A. L. Buchignani and M. De Wet, " An Engineering Manual for Slope Stability Studies," Virginia Tech, Blacksburg, 1987.
- [5] O. C. Zienkiewicz and R. L. Taylor, " The Finite Element Method Solid Mechanics," Butterworth-Heinemann, Oxford, Vol. 2, 2000, p. 459.
- [6] G. Dhatt and G. Touzot, " Une Présentation de la Méthode des Eléments Finis," Hermes Science Publications, Paris, 1981, p. 543.
- [7] K. C. San and T. Matsui, " Application of Finite Element Method System to Reinforced Soil," Proceeding International Symposium on Earth Reinforcement Practice, Kyusu, 11 November 1992, pp. 403-408.

- [Open Special Issues](#)
- [Published Special Issues](#)
- [Special Issues Guideline](#)

[OJCE Subscription](#)
[Most popular papers in OJCE](#)
[About OJCE News](#)
[Frequently Asked Questions](#)
[Recommend to Peers](#)
[Recommend to Library](#)
[Contact Us](#)

Downloads:	10,318
Visits:	65,853

[Sponsors >>](#)

- [8] K. Ugai, " Availability of Shear Strength Reduction Method in Stability Analysis," Tsuchi-to-Kiso, Vol. 38, No. 1, 1990, pp. 67-72.
- [9] PLAXIS, " Finite Element Code for Soil and Rock Analysis," Brinkgreve, et al., Ed., PLAXIS-2D Version