Slope stability of soft tailings foundations – Limit Equilibrium vs stress based methods

A Mojami

1. Technical Director - Dams, GHD, Brisbane Queensland 4000. Email: alireza.mojami@ghd.com

ABSTRACT
The design and stability analysis of soft foundations for new embankments is commonly faced in the design of tailings storage facilities. These could include the upstream raise of a tailings dam or construction of an internal bund where the new embankment raise is founded on conditioned or improved tailings.

The conditioned tailings layer, is sometimes underlain by zones of under-consolidated soft tailings with the potential for strain softening. The stability model of these problems could generally be represented as the embankment founded on a “crust” of relatively stiff tailings and zones of interbedded soft tailings. The stability modellings are often characterised by deep seated failure surfaces passing through the soft tailings. The limit equilibrium methods are widely used in the slope stability analysis, however, the results could be highly impacted by numerical problems resulting from the very low strength properties of the soft tailings in the foundation and the large difference between the strength properties of improved “crust” layer, which can often be observed as poorly converged slope surfaces. The stress based (eg Finite Element based) slope stability methods are able to model the soil behaviour in a more refined approach. The common challenge in using the stress based stability methods is the uncertainties in in-situ elastic and plastic properties of tailings.

In this paper, the application of limit equilibrium and stress based methods in the stability analysis of soft tailings foundations are discussed through practical examples. The sensitivity of these methods to the strength parameters and the key items in the interpretation of the results are discussed and the methods are compared as a practical and simplified approach to the stability analysis of soft tailings foundations.