Calibration of Nkt Value for Iron Ore Tailings

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# ABSTRACT

It is common practice to undertake Cone Penetration Testing (CPT) supplemented by electric Vane Shear Testing (eVST) on tailings to investigate its in-situ undrained shear strength. However, a common issue of this practice is the calibrated *N*kt value could be exceptionally low, leading to unconservative estimation of undrained shear strength.

Some research has suggested that undertaking eVST on some tailings, e.g. iron ore tailings, under the standard/suggested Rate of Rotation (RoR) of six (6) degree per minute (AS 1289.6.2.1-2001) may be too slow to achieve a fully undrained condition. A (partially) drained condition could result in a higher measured shear strength of the tailings, and thus an exceptionally low calibrated *N*kt Value.

This paper presents a case study of calibrating Nkt value for iron ore tailings using the results of a CPT and eVST campaign designed to overcome the above-mentioned shortcomings.

Key considerations in the design of the CPT and eVST campaign include:

* The eVST was undertaken at varied RoR higher than six (6) degree per minute to investigate the effect of drainage conditions on the shear strength of iron ore tailings.
* Shelby tube sampling was undertaken at the locations of the eVST with subsequent laboratory testing carried out, aiming to confirm the degree of saturation and particle segregation for the tested locations.

Key findings of this case study include:

* Despite a degree of particle segregation was observed between tested locations, a correlation can be established between the calibrated *N*kt values and Blight’s Time Factor *T* (Blight 1968).
* A *T* of 0.05 represents the transition between drained and undrained conditions, where the tested shear strength of the iron ore tailings is the lowest. Therefore, the calibrated *N*kt value corresponding to *T* of 0.05 may be adopted as design *N*kt value.