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The practicalities of effective stress measurement in rock

I Gray MAusIMM.

Managing Director, Sibra Pty Ltd, Acacia Ridge, Brisbane, Queensland 4110

ABSTRACT

This paper examines the practical limitations that affect the measurement of stress in rock. As most rock stress measurement is conducted through the invasive process of drilling a hole in a rock mass, the nature of the rock and its response to being drilled form the basis of the stress measurement process. The prime techniques to measure stress down a borehole are to conduct hydraulic fracturing and its variant hydro-jacking, overcoring, and the examination of the borehole wall for breakout or tensile fracture. It is also possible in some circumstances to use the sonic velocity within the rock mass as an indicator of the stress situation. Other structural indicators of stress such as joints, faulting and intrusions are useful but may not reflect the current stress situation within the rock mass. The variability of stress within the rock mass also needs to be considered as it is quite unusual to have a monotonic stress situation throughout any rock mass. The outdated concept of measuring the far field stress in a few measurement for use in a numerical model is quite dangerous. It is essential to make multiple measurements and to generate an understanding of its distribution in some form of model before stress can sensibly be incorporated into underground design.