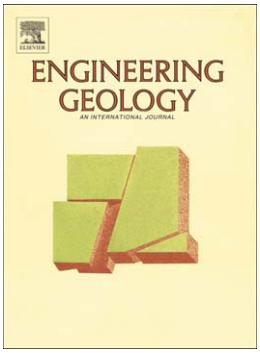

Improvements to field and remote sensing methods for mapping discontinuity persistence and intact rock bridges in rock slopes

Zack Tuckey, Doug Stead

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Improvements to field and remote sensing methods for mapping discontinuity persistence and intact rock bridges in rock slopes

Zack Tuckey, SRK Consulting Australasia, ztuckey@srk.com.au

Doug Stead, Simon Fraser University, dstead@sfu.ca

Abstract

Discontinuity persistence and intact rock bridges are critical factors that influence the stability of rock slopes. Persistence influences the extent of pre-existing potential failure surfaces, and intact rock bridges can add cohesion and tensile strength to an incipient failure surface, which must be destroyed before slope failure can occur. Despite continued research and improvements in mapping technology, computing power, and numerical modelling codes, there is no standard recommended methodology for field characterisation of intact rock bridges, or their incorporation into stability analysis. We use observations from remote sensing and field mapping investigations at three open pit mines and one natural rock slope to recommend improvements to field and remote sensing methods for mapping discontinuity persistence and intact rock bridges in rock slopes.

We apply a fracture network engineering approach to discontinuity trace mapping, using new intensity factors to describe intact rock bridge trace intensity R_{21}, and blast-induced fracture intensity B_{21}. We emphasize the importance of multi-scale characterisation of discontinuity persistence and rock bridges in rock slopes, and we distinguish between different classes of intact rock bridges based on scale and geometry, with particular attention given to the distinction between laboratory sample scale intact rock bridges on incipient discontinuities, and larger rock mass bridges, which represent metre or larger scale intervals of fractured rock mass that may exist between very high persistence joints and faults.

Keywords

Slope stability; discontinuity persistence; intact rock bridges

1. Introduction

Slope failures in fractured rock masses frequently involve a component of shearing and dilation of pre-existing discontinuities, combined with brittle fracture of intact rock (Stead and Wolter, 2015). Persistence describes the size of discontinuities in a rock mass, and intact