Summary

The Shear Strength of Rock Joints in Theory and Practice

The paper describes an empirical law of friction for rock joints which can be used both for extrapolating and predicting shear strength data. The equation is based on three index parameters; the joint roughness coefficient *JRC*, the joint wall compressive strength *JCS*, and the residual friction angle φ_r. All these index values can be measured in the laboratory. They can also be measured in the field. Index tests and subsequent shear box tests on more than 100 joint samples have demonstrated that φ_r can be estimated to within ± 1° for any one of the eight rock types investigated. The mean value of the peak shear strength angle (arctan τ/σ_n) for the same 100 joints was estimated to within 1/2°. The exceptionally close prediction of peak strength is made possible by performing self-weight (low stress) sliding tests on blocks with through going joints. The total friction angle (arctan $\tau/\sigma_{n)}$ at which sliding occurs provides an estimate of the joint roughness coefficient *JRC*. The latter is constant over a range of effective normal stress of at least four orders of magnitude. However, it is found that both *JRC* and *JCS* reduce with increasing joint length. Increasing the length of joint therefore reduces not only the peak shear strength, but also the peak dilation angle and the peak shear stiffness. These important scale effects can be predicted at a fraction of the cost of