

Shear and Tensile Strengths

If the rock mass prefers to deform by displacements along the discontinuities, the shear and (or) tensile strengths of the discontinuities must be less than those for initiation of new failure surfaces in the coherent rock. This fact led Hagerman (1966), Coates (1964), and others to base their classification in part on the uniaxial compressive strength of the coherent specimen. Hagerman, in view of local conditions, reports that the discontinuities, mainly macrofractures, are decisive in the deformation of the rock mass only for rocks with compressive strengths greater than 980 bars.

Perhaps a more direct approach is illustrated by the work of Lane and Heck (1964) and Byerlee (1966). They studied the frictional characteristics along natural macrofractures in triaxial tests, and compared the results to the mechanical behavior of the corresponding intact samples. For a given angle between the surface discontinuity and the axial load, the shear stresses for sliding along the surface at different normal stresses are recorded. An envelope for sliding along that surface is obtained and compared to the envelope for the intact sample in order to define fields of failure and stability (Figure 16). Through tests such as these useful engineering data for a given situation can be obtained. In addition they contribute along with Donath (1961), Jaeger (1959), Handin and Stearns (1964), Henkel et al. (1964), Lang (1964), Withers (1964), and others to the general understanding of the factors that influence the coefficient of sliding friction.

Granted the successful completion of these studies, the problem would still remain for the geologist or engineer to estimate the mechanical effects of the discontinuities in the field. Description of the character of the surfaces is a start to at least a qualitative estimate of their past or potential mechanical involvement. Probably significant in this regard are surface