samples and with sample size. Indeed, Habib and Bernaix hold that rocks are different in their behavior from other solids in that they are fractured. In agreement, Mendes et al. (1966) define their rock quality index as inversely proportional to the percent of microfracturing (Figure 7). Hagerman (1966) and Hansági (1966) also subscribe to the view that the mechanical properties of rocks and their state of anisotropy are mainly brought about by the existence of fractures. The relative importance of the microfractures, however, probably decreases with increasing confining pressure.

Primary Anisotropy

Except for consideration of preferred crystallographic orientations the factors enumerated thus far characterize both isotropic and anisotropic rocks. Morphological anisotropy and the differential mechanical behavior that results are usually caused by the nonrandom spatial and distributional character of certain fabric elements. Some of these are primary (related to the formation and diagenetic and metamorphic history of the rock) and some are secondary (related to the tectonic history). The former are discussed in this section and the latter in the following one, all within the framework of the coherent rock rather than the rock mass.

Anisotropy caused by primary elements of the rock fabric are apt to be most important in the sedimentary and in some metamorphic rocks. Aside from preferred crystallographic orientations that can result from growth or recrystallization, sedimentary and some metamorphic processes commonly produce preferred dimensional orientations of crystals or grains and variations in particle size and density which macroscopically are manifest in pervasive bedding, foliation, schistosity, and cleavage. These frequently are planes of low shear and tensile strength. The resulting strength anisotropies are detected by loading specimens parallel, normal, and at various angles to the layering, and are usually most obvious in tests conducted at low confining pressure.