

I. INTRODUCTION – OBJECTIVES

The stress-strain behavior of soil and rock is complex and difficult to characterize. Modulus values are affected by many factors including soil type and density, rock type and joint spacing, stress and strain magnitude, and whether loading occurs under drained or undrained conditions.

Laboratory tests are of very limited value for measuring modulus values, because of the effects of disturbance on soil behavior and the effects of joints, faults and other discontinuities on rock mass behavior. As a consequence, correlations of soil and rock modulus with results of laboratory or in situ tests are more practical and effective than direct measurements, and are often used. The purpose of this manual is to collect, explain, and organize the most useful of these correlations to make them clearer, more readily accessible, and easier to use.

The manual begins with a discussion of stress-strain behavior and the relationship between the various types of modulus (Young's modulus, shear modulus, bulk modulus, and constrained modulus), and the use of tangent modulus, secant modulus, and unload-reload modulus to approximate nonlinear behavior.

The current state-of-the-art with respect to estimating rock mass modulus is portrayed in the work of Evert Hoek and his colleagues, and the software tools they have developed. These tools are available without charge at the Rocscience website, discussed in Section II of this manual.