

Introduction

Nearly every problem in rock engineering and construction involves either the strength of the *in situ* rock mass or the compressibility of the rock mass. For purposes of design it is necessary to represent in equations of engineering mechanics the corresponding numerical values representing the appropriate *in situ* property.

Strength values and modulus values determined from laboratory testing of intact rock cores are recognized as not being directly applicable to the *in situ* rock mass because of the scale effect. The *in situ* mass invariably contains joints and other types of geologic discontinuities, which may be spaced from just a few inches up to several feet apart. The engineering structure will usually stress a mass of rock sufficiently large to include several of these discontinuities. Laboratory tests, on the other hand, are performed on intact rock cores containing no discontinuities (or, at most, a single joint).

In recognition of this situation, engineers have more and more over the last two decades gone to large-scale field testing, particularly with respect to design studies for large concrete dams and related structures. With the advent of rock mechanics and its development to the status of a recognized discipline in the 1960's, there has been even greater emphasis on field testing. New methods and concepts of field testing have recently been put forward by several workers at various organizations for both *in situ* shear tests and *in situ* modulus of deformation tests. The present symposium treats the latter.

The deformation modulus is used not only in the design of concrete dams, particularly arch dams, but also in the design of steel liners in pressure tunnels, and in settlement analyses of heavy bridge piers, high-rise structures, and nuclear reactors founded on rock. Displacement calculations for the arch and walls of large underground openings also make use of the modulus.

Because of the wide interest in the subject and its timely nature, the organizing committee felt it would be appropriate to bring together specialists and organizations who are currently using the new and varied methods—not so much for the sake of attempting to standardize the procedures but as an opportunity to compare methods, results, and possible future developments and to make this information available to the engineering profession.

The interest was certainly manifested by the lively discussion from the floor and from the panel participants, R. Goodman, A. Hendron, G. Kruse,

M. Rocha, and G. Wallace on the topic: Should *In Situ* Tests for Determining the Modulus of Deformation of Rock be Standardized? moderated by G. B. Clark and myself. The general, although perhaps not unanimous, opinion was that the time was not ripe for standardization of any one of the methods at this time because of the newness of some of the methods and the additional developments to be expected in the near future. Perhaps to be more preferred would be the early compilation of recommended standards of practice for each of the tests.

Special thanks are given to the authors of the papers, to the members of the panel, to Cochairman E. J. Deklotz, to Comoderator of the panel discussion G. B. Clark, and to all members of Subcommittee 12 on Rock Mechanics of Committee D-18 for their cooperation and support.

Don U. Deere

Professor of civil engineering and of geology,
University of Illinois, Urbana, Ill.;
symposium chairman.