



Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures¹

This standard is issued under the fixed designation D 7012; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of the strength of intact rock core specimens in uniaxial compression and confined compression. The tests provide data in determining the strength of rock, namely: the uniaxial strength, shear strengths at varying pressures and varying temperatures, angle of internal friction, (angle of shearing resistance), and cohesion intercept. The test method specifies the apparatus, instrumentation, and procedures for determining the stress-axial strain and the stress-lateral strain curves, as well as Young's modulus, E , and Poisson's ratio, ν . It should be observed that this method makes no provision for pore pressure measurements and specimens are undrained (platens are not vented). Thus the strength values determined are in terms of total stress, that is, are not corrected for pore pressures. This test method does not include the procedures necessary to obtain a stress-strain curve beyond the ultimate strength.

1.1.1 This standard replaces and combines the following Standard Test Methods for: D 2664 Triaxial Compressive Strength of Undrained Rock Core Specimens Without Pore Pressure Measurements; D 5407 Elastic Moduli of Undrained Rock Core Specimens in Triaxial Compression Without Pore Pressure Measurements; D 2938 Unconfined Compressive Strength of Intact Rock Core Specimens; and D 3148 Elastic Moduli of Intact Rock Core Specimens in Uniaxial Compression.

1.1.2 The original four standards are now referred to as Methods in this standard as follows: Method A — Triaxial Compressive Strength of Undrained Rock Core Specimens Without Pore Pressure Measurements; Method B — Elastic Moduli of Undrained Rock Core Specimens in Triaxial Compression Without Pore Pressure Measurements; Method C — Unconfined Compressive Strength of Intact Rock Core Specimens; and Method D — Elastic Moduli of Intact Rock Core Specimens in Uniaxial Compression; and Option A — Elevated Temperatures.

1.1.3 The original four standards are now referred to as Methods in this standard as follows: Method A (D2664) Triaxial Compressive Strength of Undrained Rock Core Specimens Without Pore Pressure Measurements; Method B (D5407) Elastic Moduli of Undrained Rock Core Specimens in Triaxial Compression Without Pore Pressure Measurements, Method C (D2938) Unconfined Compressive Strength of Intact Rock Core Specimens; Method D (D3148) Elastic Moduli of Intact Rock Core Specimens in Uniaxial Compression; and Option A Elevated Temperatures.

1.2 For an isotropic material, the relation between the shear and bulk moduli and Young's modulus and Poisson's ratio are:

$$G = \frac{E}{2(1 + \nu)} \quad (1)$$

$$K = \frac{E}{3(1 - 2\nu)} \quad (2)$$

where:

G = shear modulus,

K = bulk modulus,

E = Young's modulus, and

ν = Poisson's ratio.

1.2.1 The engineering applicability of these equations decreases with increasing anisotropy of the rock. It is desirable to conduct tests in the plane of foliation, cleavage or bedding and at right angles to it to determine the degree of anisotropy. It is noted that equations developed for isotropic materials may give only approximate calculated results if the difference in elastic moduli in two orthogonal directions is greater than 10 % for a given stress level.

NOTE 1—Elastic moduli measured by sonic methods (Test Method D 2845) may often be employed as preliminary measures of anisotropy.

1.3 This test method given for determining the elastic constants does not apply to rocks that undergo significant inelastic strains during the test, such as potash and salt. The

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