



Standard Test Methods 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 D7012; 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 These four test methods cover the determination of the strength of intact rock core specimens in uniaxial and triaxial compression. Methods A and B determine the triaxial compressive strength at different pressures and Methods C and D determine the unconfined, uniaxial strength.

1.2 Methods A and B can be used to determine the angle of internal friction, angle of shearing resistance, and cohesion intercept.

1.3 Methods B and D specify 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 . These methods make 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 and are not corrected for pore pressures. These test methods do not include the procedures necessary to obtain a stress-strain curve beyond the ultimate strength.

1.4 Option A allows for testing at different temperatures and can be applied to any of the test methods, if requested.

1.5 This standard replaces and combines the following Standard Test Methods: D2664 Triaxial Compressive Strength of Undrained Rock Core Specimens Without Pore Pressure Measurements; D5407 Elastic Moduli of Undrained Rock Core Specimens in Triaxial Compression Without Pore Pressure Measurements; D2938 Unconfined Compressive Strength of Intact Rock Core Specimens; and D3148 Elastic Moduli of Intact Rock Core Specimens in Uniaxial Compression. The original four standards are now referred to as Methods in this standard.

1.5.1 *Method A: Triaxial Compressive Strength of Undrained Rock Core Specimens Without Pore Pressure Measurements.*

¹ These test methods are under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.12 on Rock Mechanics.

Current edition approved May 1, 2014. Published June 2014. Originally approved in 2004. Last previous edition approved in 2013 as D7012 – 13. DOI: 10.1520/D7012-14.

1.5.1.1 Method A is used for obtaining strength determinations. Strain is not typically measured; therefore a stress-strain curve is not produced.

1.5.2 *Method B: Elastic Moduli of Undrained Rock Core Specimens in Triaxial Compression Without Pore Pressure Measurements.*

1.5.3 *Method C: Uniaxial Compressive Strength of Intact Rock Core Specimens.*

1.5.3.1 Method C is used for obtaining strength determinations. Strain is not typically measured; therefore a stress-strain curve is not produced.

1.5.4 *Method D: Elastic Moduli of Intact Rock Core Specimens in Uniaxial Compression.*

1.5.5 *Option A: Temperature Variation*—Applies to any of the methods and allows for testing at temperatures above or below room temperature.

1.6 For an isotropic material in Test Methods B and D, 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.

1.6.1 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 D2845) may often be employed as a preliminary measure of anisotropy.

*A Summary of Changes section appears at the end of this standard