



Designation: D4623 – 16

Standard Test Method for Determination of In Situ Stress in Rock Mass by Overcoring Method—Three Component Borehole Deformation Gauge¹

This standard is issued under the fixed designation D4623; 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 ambient local stresses (principal and secondary) in a rock mass and the equipment required to perform in situ stress tests using a three-component borehole deformation gauge (BDG) that was developed by the U.S. Bureau of Mines (USBM); see [Note 1](#).

1.2 The test procedure and method of data reduction are described, including the theoretical basis and assumptions involved in the calculations.

1.3 A section is included on troubleshooting equipment malfunctions.

NOTE 1—The gauge used in this test method is commonly referred to by users as a USBM gauge (U.S. Bureau of Mines three-component borehole deformation gauge).²

1.4 The values stated in inch-pound units are to be regarded as standard, except as noted below. The values given in parentheses are mathematical conversions to SI units, which are provided for information only and are not considered standard. Reporting of test results in units other than SI shall not be regarded as nonconformance with this test method.

1.5 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:³

[D653 Terminology Relating to Soil, Rock, and Contained Fluids](#)

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

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² Considerable information presented in this test method was taken from *Bureau of Mines Information Circular No. 8618*, and Hooker, V.E., and Bickel, D.L., “Overcoring Equipment and Techniques Used in Rock Stress Determination,” Denver Mining Research Center, Denver, CO, 1974.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

[D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction](#)

[D4394 Test Method for Determining In Situ Modulus of Deformation of Rock Mass Using Rigid Plate Loading Method](#)

[D4395 Test Method for Determining In Situ Modulus of Deformation of Rock Mass Using Flexible Plate Loading Method](#)

[D4971 Test Method for Determining In Situ Modulus of Deformation of Rock Using Diametrically Loaded 76-mm \(3-in.\) Borehole Jack](#)

[D6026 Practice for Using Significant Digits in Geotechnical Data](#)

[D7012 Test Methods for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures](#)

3. Terminology

3.1 Definitions:

3.1.1 For terminology used in this test method, refer to Terminology [D653](#).

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *deformation, n*—displacement change in dimension of the borehole due to changes in stress.

3.2.2 *in situ stress, n*—the stress levels and orientations existing in the rock mass before excavation.

3.2.3 *principal plane, n*—any plane in which the shear stresses are zero.

3.2.4 *principal stresses, n*—the normal stresses acting on the three principal planes and which are perpendicular to each other.

3.2.4.1 *Discussion*—The major, intermediate or minor normal or principal stresses refers to the maximum, intermediate and minor normal stresses occurring in the rock element.

3.2.5 *reverse case, n*—in rock which tends to fracture easily, “disc” or “poker chip” during overcoring, the borehole gauge can be modified by replacing the standard housing with a “reverse case” housing which allows the cantilever plungers to be positioned very close to the start of the EX hole.

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