



Standard Test Method for Direct Tensile Strength of Intact Rock Core Specimens¹

This standard is issued under the fixed designation D 2936; 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 direct tensile strength of intact cylindrical rock specimens.

1.2 The values stated in SI units are to be regarded as standard. The values provided in parenthesis are for information only.

1.3 *This standard does not purport to address all of the safety concerns, 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:*²

D 2216 Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

D 3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

D 4543 Practices for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerances

E 4 Practices for Force Verification of Testing Machines

E 122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

3. Summary of Test Method

3.1 A rock core sample is cut to length and its ends are cemented to metal caps. The metal caps are attached to a testing machine and the specimen is loaded in tension until it fails.

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 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.

4. Significance and Use

4.1 Rock is much weaker in tension than in compression. Thus, in determining the failure condition for a rock structure, many investigators employ tensile strength of the component rock as the failure strength for the structure. Direct tensile stressing of rock is the most basic test for determining the tensile strength of rock.

5. Apparatus

5.1 *Loading Device*, to apply and measure axial load on the specimen, of sufficient capacity to apply the load at a rate conforming to the requirements of 8.2. The device shall be verified at suitable time intervals in accordance with the procedures given in Practices E 4 and shall comply with the requirements prescribed therein.

5.2 *Caps*—Cylindrical metal caps that, when cemented to the specimen ends, provide a means through which the direct tensile load can be applied. The diameter of the metal caps shall not be less than that of the test specimen, nor shall it exceed the test specimen diameter by more than 1.10 times. Caps shall have a thickness of at least 30 mm (1¼ in.). Caps shall be provided with a suitable linkage system for load transfer from the loading device to the test specimen. The linkage system shall be so designed that the load will be transmitted through the axis of the test specimen without the application of bending or torsional stresses. The length of the linkages at each end shall be at least two times the diameter of the metal end caps. One such system is shown in Fig. 1.

NOTE 1—Roller of link chain of suitable capacity has been found to perform quite well in this application. Because roller chain flexes in one plane only, the upper and lower segments should be positioned at right angles to each other to effectively reduce bending in the specimen. Ball-and-socket, cable, or similar arrangements have been found to be generally unsuitable as their tendency for bending and twisting makes the assembly unable to transmit a purely direct tensile stress to the test specimen.

6. Sampling

6.1 Select the specimen from the cores to represent a valid average of the type of rock under consideration. This can be achieved by visual observations of mineral constituents, grain

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