Designation: D 3967 – 95a (Reapproved 2001)

Standard Test Method for Splitting Tensile Strength of Intact Rock Core Specimens[1]

This standard is issued under the fixed designation D 3967; 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 testing apparatus, specimen preparation, and testing procedures for determining the splitting tensile strength of rock by diametral line compression of a disk.

NOTE 1—The tensile strength of rock determined by tests other than the straight pull test is designated as the "indirect" tensile strength and, specifically, the value obtained in Section 8 of this test is termed the "splitting" tensile strength.

1.2 The values stated in SI units are to be regarded as the standard.

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:*

E 4 Practices for Force Verification of Testing Machines[2]

E 691–92 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method[3]

3. Significance and Use

3.1 By definition the tensile strength is obtained by the direct uniaxial tensile test. But the tensile test is difficult and expensive for routine application. The splitting tensile test appears to offer a desirable alternative, because it is much simpler and inexpensive. Furthermore, engineers involved in rock mechanics design usually deal with complicated stress fields, including various combinations of compressive and tensile stress fields. Under such conditions, the tensile strength should be obtained with the presence of compressive stresses to be representative of the field conditions. The splitting tensile strength test is one of the simplest tests in which such stress fields occur. Since it is widely used in practice, a uniform test method is needed for data to be comparable. A uniform test is also needed to insure positively that the disk specimens break diametrally due to tensile pulling along the loading diameter.

4. Apparatus

4.1 *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 in 7.3. It shall be verified at suitable time intervals in accordance with Practices E 4 and shall comply with the requirements prescribed therein.

4.2 *Bearing Surfaces*—The testing machine shall be equipped with two steel bearing blocks having a Rockwell hardness of not less than 58 HRC (see Note 2).

NOTE 2—False platens, with bearing faces conforming to the requirements of this standard, may be used. These shall be oil hardened to more than 58 HRC, and surface ground. With abrasive rocks these platens tend to roughen after a number of specimens have been tested, and hence need to be surfaced from time to time.

4.2.1 *Flat Bearing Blocks*—During testing the specimen can be placed in direct contact with the machine bearing plates (or false platens, if used) (see Fig. 1). The bearing faces shall not depart from a plane by more than 0.0125 mm when the platens are new and shall be maintained within a permissible variation of 0.025 mm. The bearing block diameter shall be at least as great as the specimen thickness.

4.2.2 *Curved Bearing Blocks*, may be used to reduce the contact stresses. The radius of curvature of the supplementary bearing plates shall be so designed that their arc of contact with the specimen will in no case exceed 15° or that the width of contact is less than $D/6$, where D is the diameter of the specimen.

NOTE 3—Since the equation used in 8.1 for splitting tensile strength is derived based on a line load, the applied load shall be confined to a very narrow strip if the splitting tensile strength test is to be valid. But a line load creates extremely high contact stresses which cause premature cracking. A wider contact strip can reduce the problems significantly. Investigations show that an arc of contact smaller than 15° causes no more than 2 % of error in principal tensile stress while reducing the incidence of premature cracking greatly.

4.2.3 *Spherical Seating*—One of the bearing surfaces should be spherically seated and the other a plain rigid block. The diameter of the spherical seat shall be at least as large as that of the test specimen, but shall not exceed twice the diameter of the test specimen. The center of the sphere in the

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[2] *Annual Book of ASTM Standards*, Vol 03.01.

[3] *Annual Book of ASTM Standards*, Vol 14.02.