



Standard Test Method for Splitting Tensile Strength for Brittle Nuclear Waste Forms¹

This standard is issued under the fixed designation C1144; 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 is used to measure the static splitting tensile strength of cylindrical specimens of brittle nuclear waste forms. It provides splitting tensile-strength data that can be used to compare the strength of waste forms when tests are done on one size of specimen.

1.2 The test method is applicable to glass, ceramic, and concrete waste forms that are sufficiently homogeneous (**Note 1**) but not to coated-particle, metal-matrix, bituminous, or plastic waste forms, or concretes with large-scale heterogeneities. Cementitious waste forms with heterogeneities >1 to 2 mm and <5 mm can be tested using this procedure provided the specimen size is increased from the reference size of 12.7 mm diameter by 6 mm length, to 51 mm diameter by 100 mm length, as recommended in Test Method C496/C496M and Practice C192/C192M.

NOTE 1—Generally, the specimen structural or microstructural heterogeneities must be less than about one-tenth the diameter of the specimen.

1.3 This test method can be used as a quality control check on brittle waste forms and may be useful for optimizing waste form processing. Meaningful comparison of waste forms, however, requires data obtained on specimens of one size.

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

1.5 *This standard may involve hazardous materials, operations, and equipment. 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.* For specific hazard statements, see Section 7.

¹ This test method is under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.07 on Waste Materials.

Current edition approved Feb. 1, 2011. Published February 2011. Originally approved in 1989. Last previous edition approved in 2004 as C1144 - 89 (2004). DOI: 10.1520/C1144-89R11.

2. Referenced Documents

2.1 ASTM Standards:²

C39/C39M Test Method for Compressive Strength of Cylindrical Concrete Specimens

C192/C192M Practice for Making and Curing Concrete Test Specimens in the Laboratory

C496/C496M Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens

C773 Test Method for Compressive (Crushing) Strength of Fired Whiteware Materials

D2938 Test Method for Unconfined Compressive Strength of Intact Rock Core Specimens (Withdrawn 2005)³

E4 Practices for Force Verification of Testing Machines

2.2 Society of Manufacturing Engineers:

Geometrical Tolerance Interpretations, SME Tool and Manufacturing Engineers Handbook⁴

3. Summary of Test Method

3.1 A right-circular cylinder of the waste solid is loaded diametrically between two hardened, parallel bearing blocks positioned between the specimen and the two test machine platens, one of which is moving at a constant speed relative to the other (**Fig. 1**).

3.2 As the load increases, the resultant stress eventually reaches the fracture strength of the material, and the specimen splits along the vertical diameter, usually with some subsidiary fracture at other locations. The splitting tensile strength, T (MPa), is calculated from the measured fracture load as follows:

$$T = 2P/\pi LD \quad (1)$$

where:

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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from Society of Manufacturing Engineers, P.O. Box 930, One SME Dr., Dearborn, MI 48121.