



Standard Test Method for Flexural Strength of Manufactured Carbon and Graphite Articles Using Three-Point Loading at Room Temperature¹

This standard is issued under the fixed designation D7972; 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 determination of the flexural strength of manufactured carbon and graphite articles using a square, rectangular or cylindrical beam in three-point loading at room temperature.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[C78 Test Method for Flexural Strength of Concrete \(Using Simple Beam with Third-Point Loading\)](#)

[C559 Test Method for Bulk Density by Physical Measurements of Manufactured Carbon and Graphite Articles](#)

[C1161 Test Method for Flexural Strength of Advanced Ceramics at Ambient Temperature](#)

[C1239 Practice for Reporting Uniaxial Strength Data and Estimating Weibull Distribution Parameters for Advanced Ceramics](#)

[C1322 Practice for Fractography and Characterization of](#)

[Fracture Origins in Advanced Ceramics](#)

[D7775 Guide for Measurements on Small Graphite Specimens](#)

[E4 Practices for Force Verification of Testing Machines](#)

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

3. Terminology

3.1 *Definitions:*

3.1.1 *flexural strength, n* —a measure of the ultimate load carrying capacity of a specified beam in bending.

3.1.2 *grain, n* —in manufactured (synthetic) carbon and graphite, particle of filler material (usually coke or graphite) in the starting mix formulation. Also referred to as granular material, filler particle, or aggregate material.

4. Significance and Use

4.1 This test method provides a framework for material development, quality control, characterization, and design data generation purposes. The user needs to assess the applicability of the method on the specific material and for the intended use, as shown by the interlaboratory study.

4.2 This test method determines the maximum loading on a graphite specimen with simple beam geometry in three-point bending, and it provides a means for the calculation of flexural strength at ambient temperature and environmental conditions.

4.3 The flexure stress is computed based on simple beam theory with assumptions that the material is isotropic and homogeneous, the moduli of elasticity in tension and compression are identical, and the material is linearly elastic. For materials with large grains, the minimum specimen dimension should be significantly larger than the maximum grain size (see Guide [D7775](#)).

4.4 Flexural strength of a group of test specimens is influenced by several parameters associated with the test procedure. Such factors include the loading rate, test environment, specimen size, specimen preparation, and test fixtures. Specimen sizes and fixtures should be chosen to reduce errors due to material variability or testing parameters, such as friction and non-parallelism of specimen surfaces.

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.F0 on Manufactured Carbon and Graphite Products.

Current edition approved May 1, 2020. Published June 2020. Originally approved in 2014. Last previous edition approved in 2014 as D7972 – 14. DOI: 10.1520/D7972-14R20.

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.