MANDATORY APPENDIX 38
STANDARD TEST METHOD FOR COMPRESSIVE STRENGTH OF IMPREGNATED GRAPHITE

38-1 SCOPE

(a) This test method covers the determination of the compressive strength of impervious carbon and graphite at room temperature. 
(b) 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.

38-2 REFERENCED DOCUMENTS

ASTM C709, Standard Terminology Relating to Manufactured Carbon and Graphite
ASTM E4, Standard Practices for Force Verification of Testing Machines
ASTM E177, Standard Practice for Use of the Terms Precision and Bias in ASTM Test Methods
ASTM E691, Standard Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
Publisher: American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, (610) 832-9585, (https://www.astm.org)

38-3 TERMINOLOGY

See UIG-3 for definitions of terms related to manufactured impregnated graphite.

38-4 SIGNIFICANCE AND USE

Impregnated graphite can usually support higher loads in compression than in any other mode of stress. The compressive strength test, therefore, provides a measure of the maximum load-bearing capability of carbon and graphite objects and the results are used to generate material flexural-compression strength ratios.

38-5 APPARATUS

(a) Test machine, conforming to Practice E4 and to the requirements for speed of testing prescribed in Section 8 of this test method. 
(b) All load-bearing machine and fixture surfaces shall have a minimum hardness of 45 HRC and surface finish of 16 μin. (0.4 μm) rms maximum. Surfaces in contact with the specimen shall be flat to less than 0.0005 in./in. (0.0005 mm/mm). 
(c) Examples of arrangements of the load train are shown schematically in Figs. 1 and 2 in ASTM C695.

38-6 SAMPLING

Samples may be taken from locations and orientations that satisfy the objectives of the test.

38-7 TEST SPECIMEN

The test specimen shall be a 3/4 in. (19 mm) cube or an O.D./I.D. tube with height equal to the tube O.D. with ends machined to yield planar and parallel faces. These faces shall be perpendicular to within 0.001 in. (0.025 mm) of a length total indicator reading. Reasonable care should be exercised to ensure that all edges are sharp and without chips or other flaws.

38-8 PROCEDURE

(a) Center the specimen in the machine between the contact surfaces. The deviation of the specimen axis from the machine axis shall be less than 5% of the specimen length. Centering can be assisted by appropriate circles marked on the contact surfaces. 
(b) Place an appropriate guard around the specimen to deflect flying fragments at failure. 
(c) Apply the load continuously, and without shock until ultimate failure. 
(d) If the test machine is equipped with a load or strain pacing device, a constant load or strain rate may be used.

The test specimen shall be either a 3/4 in. (19mm) cube, a flat circular disc with height equal to the disc O.D., or an O.D./I.D. tube with height equal to the tube O.D. The ends of all specimens shall be machined to yield planar and parallel faces.
38-9 CALCULATION

Calculate the compressive strength of each specimen as follows:

\[ C = \frac{W}{A} \]

where

\( A \) = calculated area of the gage section of the specimen, in\(^2\) (mm\(^2\))
\( C \) = compressive strength of specimen, psi (MPa)
\( W \) = total load on the specimen at failure, lbf (N)

38-10 REPORT

The report shall include the following:

(a) type of testing machine, hydraulic or screw
(b) type and size of contact blocks
(c) general description of material being tested
(d) dimensions, location, and orientation of specimens
(e) details of specimen preparation

(f) rate of crosshead or platen movement, or load rate, or strain rate
(g) load of failure, failure mode, and compressive strength of each specimen, and material tested
(h) mean compressive strength and standard deviation for material tested

38-11 PRECISION AND BIAS

(a) Precision. The precision statements given in this section are based on the comparison of the mean strength by the Student “t” test and carrying out the statistical analysis of the data obtained in a round robin as recommended by Practice E 691. The round robin was carried out on two materials.

(b) Comparison of the Means. The comparison of the means by the Student’s t test leads to the conclusion that the average strength values measured by each laboratory on each material is considered statistically equal at 95% confidence level.