

BRITISH STANDARD
METHODS OF TESTING
VULCANIZED
RUBBER

PART D3. DETERMINATION OF
CRUSHING STRENGTH OF EBONITE

B.S. 903 : Part D 3 : 1957

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BRITISH STANDARDS INSTITUTION

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THIS BRITISH STANDARD, having been approved by the Rubber Industry Standards Committee and endorsed by the Chairman of the Chemical Divisional Council, was published under the authority of the General Council on 30th August, 1957.

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 2500, indexed and cross-indexed for reference, together with an abstract of each standard, will be found in the Institution's Yearbook, price 15s.

This standard makes reference to the following British Standard:

B.S. 350 Conversion factors and tables.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following B.S.I. references relate to the work on this standard:—
Committee reference RUC/10 and RUC/10/6
Draft for comment CW(RUC) 6894

CO-OPERATING ORGANIZATIONS

The Rubber Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and industrial organizations:—

Board of Trade

*British Rubber Producers' Research Association

*Federation of British Rubber and Allied Manufacturers' Associations

*Institution of the Rubber Industry

*Ministry of Supply

Natural Rubber Development Board

*Research Association of British Rubber Manufacturers

*Rubber Growers' Association

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:—

Admiralty

Air Ministry

Association of British Chemical Manufacturers

Association of British Ebonite Manufacturers

British Cellular Rubber Manufacturers' Association

British Chemical Plant Manufacturers' Association

British Electrical and Allied Industries Research Association

British Railways, The British Transport Commission

British Rubber and Resin Adhesive Manufacturers' Association

Department of the Government Chemist

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National Physical Laboratory (D.S.I.R.)

Royal Institute of Chemistry

Rubber Trade Association of London

Society of Motor Manufacturers and Traders Ltd.

BRITISH STANDARD

METHODS OF TESTING
VULCANIZED RUBBER

Part D 3 : Determination of Crushing Strength
of Ebonite

FOREWORD

This British Standard has been published under the authority of the Rubber Industry Standards Committee. In deciding to issue a revision of the 1950 edition, the committee has considered it desirable to publish B.S. 903 in separate parts, and the present part replaces Part 38 of 1950.

The main differences are that the title has been altered and that in this standard a method of determining crushing strength has been added. Part 38 of B.S. 903 : 1950 provided only a proof test.

NOTE. Where metric equivalents have been given the figures in British units are to be regarded as the standard. The metric conversions are approximate. More accurate conversions should be based on the tables in B.S. 350, 'Conversion factors and tables'.

The group of parts to which this part belongs covers methods of testing ebonite and is marked with the prefix letter 'D'. Further parts in the group have been issued as follows:—

- Part D 1. Determination of plastic yield temperature of ebonite.
- Part D 2. Determination of plastic yield of ebonite at a specified temperature.
- Part D 4. Determination of cross-breaking strength of ebonite.
- Part D 5. Determination of tensile strength of ebonite.

METHOD

SECTION 1 DETERMINATION OF CRUSHING STRENGTH

1.1 Definitions. For the purpose of this British Standard the following definitions shall apply:

Compressive stress. A stress applied so as to compress the test piece. It is the average load per unit area of the initial cross section.

Crushing strength. The maximum compressive stress that the test piece will withstand without crushing or collapsing, the conditions being such that the stress is substantially uniform over the cross section.

1.2 Explanatory note. The size and shape of the test piece and the nature of loading may profoundly influence the values obtained. This test specifies the conditions to which the test piece shall be subjected.

1.3 Test piece. The test piece shall be a right cylinder 12 ± 0.1 mm high and 12 ± 0.1 mm in diameter. It shall be turned from the sample to a smooth finish. The surfaces shall not be ground or moulded.

1.4 Apparatus. The apparatus shall consist of two parallel flat plates which are capable of applying a compressive strain at a suitable uniform rate. The apparatus shall be provided with means for continuously indicating the load.

1.5 Procedure.

1.5.1 Conditioning of samples and test pieces. Tests should not be carried out less than 24 hours after vulcanization, and for accurate comparison between different ebonites it may be necessary that these be tested at substantially the same interval after vulcanization. Samples and test pieces shall be protected from light as completely as possible during the interval between vulcanization and testing.

The test pieces shall be conditioned at a temperature of $20 \pm 5^\circ\text{C}$ for not less than 18 hours immediately before test.

NOTE. See note under Section 1.6. Temperature of test.

1.5.2 Measurement of crushing strength. The test piece shall be placed between the plates of the compression apparatus and a compressive strain shall be applied axially and increased at a uniform rate so that the test piece fails in 30 ± 15 seconds. The maximum load applied to the test piece before it crumbles or collapses shall be noted.

1.6 Temperature of test. The test shall be carried out at a temperature of $20 \pm 5^\circ\text{C}$.

NOTE. A temperature of $20 \pm 5^\circ\text{C}$ for conditioning and testing is not practicable in all countries. In tropical countries it is difficult to maintain this temperature and an alternative temperature of $27 \pm 5^\circ\text{C}$ is therefore permitted.

1.7 Number of test pieces. Four test pieces shall be tested.

1.8 Calculation of results.

Crushing strength = $0.88 W$ kg/sq.cm

where W = total applied crushing load in kilogrammes.

Crushing strength = $5.7 W$ lb/sq.in.

where W = total applied crushing load in pounds.

The median of the results on the four test pieces shall be reported as the crushing strength of the material.

1.9 Report. The report shall state:

- (1) The crushing strength in kg/sq.cm or lb/sq.in.
- (2) Temperature of test.
- (3) Nature of the failure.

SECTION 2 PROOF TEST

2.1 Explanatory note and summary. The standard test piece is subjected to a compressive load. The method given is a proof test, in which the test piece must not fail when subjected to a specified load for a specified time.

2.2 Test piece. The test piece shall be a right cylinder 12 ± 0.1 mm high and 12 ± 0.1 mm in diameter. It shall be turned from the sample to a smooth finish. The surfaces shall not be ground or moulded.

2.3 Apparatus. The apparatus shall consist of two parallel flat plates which are capable of applying a compressive stress or strain at a suitable uniform rate and means for maintaining the required load for the period of test.

2.4 Procedure.

2.4.1 Conditioning of samples and test pieces. Tests should not be carried out less than 24 hours after vulcanization and for accurate comparison between different ebonites it may be necessary that these be tested at substantially the same interval after vulcanization. Samples and test pieces shall be protected from light as completely as possible during the interval between vulcanization and testing.

The test pieces shall be conditioned at a temperature of $20 \pm 5^\circ\text{C}$ for not less than 18 hours immediately before test.

NOTE. See note under Section 2.5. Temperature of test.

2.4.2 Proof test. The test piece shall be placed between the plates of the compression apparatus. The load shall then be steadily increased so as to reach the specified proof load in about one minute; this load shall be maintained for one minute. The test piece shall be deemed to have passed the test if it withstands this load without crumbling or collapsing.

2.5 Temperature of test. The test shall be carried out at a temperature of $20 \pm 5^\circ\text{C}$.

NOTE. A temperature of $20 \pm 5^\circ\text{C}$ for conditioning and testing is not practicable for all countries. In tropical countries it is difficult to maintain this temperature and an alternative temperature of $27 \pm 5^\circ\text{C}$ is therefore permitted.

2.6 Number of test pieces. Four test pieces shall be tested.

2.7 Report. The report shall state:

- (1) Specified load.
- (2) Number of test pieces which pass the test.
- (3) Nature of any failure.
- (4) Temperature of test.

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BRITISH STANDARDS INSTITUTION

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The principal objects of the Institution as set out in the charter are to co-ordinate the efforts of producers and users for the improvement, standardization and simplification of engineering and industrial materials; to simplify production and distribution; to eliminate the waste of time and material involved in the production of an unnecessary variety of patterns and sizes of articles for one and the same purpose; to set up standards of quality and dimensions, and to promote the general adoption of British Standards.

In carrying out its work the Institution endeavours to ensure adequate representation of all viewpoints. Before embarking on any project it must be satisfied that there is a strong body of opinion in favour of proceeding and that there is a recognized need to be met.

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