

Methods of test for

Rigid cellular materials —

Part 1: Methods 1 to 5

UDC 678 – 405.8:678.077:678.01

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The preparation of this British Standard was entrusted by the Plastics and Rubber Standards Committees (PLM/RUM/-) to Technical Committee PLM/RUM/10, upon which the following bodies were represented:

- British Plastics Federation
- British Railways Board
- British Rigid Urethane Foam Manufacturers' Association
- British Rubber Manufacturers' Association
- Department of the Environment (Building Research Establishment)
- Furniture Industry Research Association
- Furniture, Timber and Allied Trades Union
- Ministry of Defence
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This British Standard, having been prepared under the direction of the Plastics and Rubber Standards Committees, was published under the authority of the Board of BSI and comes into effect on 29 February 1988

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First published November 1968
First revision February 1988

The following BSI references relate to the work on this standard:
Committee reference
PLM/RUM/10
Draft for comment 85/39267 DC

ISBN 0 580 16037 8

Amendments issued since publication

Amd. No.	Date of issue	Comments
8868	December 1995	
10082	August 1998	Indicated by a sideline in the margin

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Foreword

This Part of BS 4370 has been prepared under the direction of the Plastics and Rubber Standards Committees and is a revision of BS 4370-1:1968, which is withdrawn. The methods of test described here are intended to apply to rigid cellular products of polymeric origin, and are not necessarily suitable for testing rigid cellular materials of inorganic origin.

Many rigid cellular products and test specimens are not isotropic. This is usually ascribed to the fact that the cells in the materials are elongated in a particular direction. This direction is referred to in this standard as the direction of anisotropy. Tests carried out in this direction usually give results differing in magnitude from those carried out in other directions.

The direction of anisotropy may vary from place to place in a product, hence the number of test specimens required in product specifications may be greater than those given herein.

Several of the methods described in this standard are based on standards prepared by Technical Committee 61, Plastics, of the International Organization for Standardization (ISO). The corresponding international standard, if any, is indicated in a note immediately following the title of each method. In this revision the methods have been realigned where appropriate with revisions made to the corresponding international standards.

Attention is drawn to BS 4370-2 to BS 4370-4 which deal with other methods of test for rigid cellular materials as follows.

- *Part 2: Method 6. Determination of shear strength and shear modulus;*
- *Part 2: Method 7. Measurement of thermal conductivity;*
- *Part 2: Method 8. Measurement of water vapour transmission;*
- *Part 2: Method 9. Determination of tensile strength;*
- *Part 2: Method 10. Determination of the volume percentage of closed cells;*
- *Part 3: Method 12. Determination of friability;*
- *Part 3: Method 13. Measurement of the coefficient of linear thermal expansion at low temperatures;*
- *Part 4: Method 14. Determination of flexural properties;*
- *Part 4: Method 15. Determination of apparent water absorption¹⁾.*

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ In preparation.

1 Scope

This Part of BS 4370 describes five methods of test applicable to rigid cellular products of polymeric origin.

NOTE 1 The methods may not be suitable for testing cellular products of inorganic origin.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Methods 1A, 1B and 1C. Measurement of dimensions

Superseded by BS EN ISO 1923:1995.

3 Method 2. Determination of apparent density

Superseded by BS EN ISO 845:1995.

4 Method 3. Compression test

Superseded by BS ISO 844:1998.

5 Method 4. Cross-breaking strength test

5.1 General

This method describes a procedure for measuring the cross-breaking strength in flexure of rigid cellular materials when subjected to three-point loading.

5.2 Apparatus

5.2.1 Apparatus for the cross-breaking strength test, as shown in Figure 1, and consisting of two parallel supports having a radius of 5 ± 0.2 mm on their supporting edges. The supports shall be set 150 ± 1.5 mm apart. The distance separating the supports shall be known to within 1.0 mm. The length of the supports shall be greater than the width of the test specimen.

5.2.2 Loading bar, having the same dimensions as the supports. This bar shall be located centrally to within 0.75 mm and its line of contact shall be substantially parallel to the lines of contact of the supports. A suitable means of loading this bar in this direction normal to the plane containing the lines of contact of the supports and recording the load at fracture shall be provided.

5.3 Test specimen

The test specimen shall be a rectangular bar with the following dimensions:

- 200 $\pm$ 2 mm long;
- 35 to 70 mm wide;
- 50 $\pm$ 0.5 mm thick (testing height).

It shall be cut without deformation of the original cell structure. Alternatively the test specimen shall be prepared by plying up pieces not less than 12 mm thick with adjacent faces of the plies in the vertical plane (see Figure 1). The plies shall be held together by tape, dowel pins or similar means applied outside the test area. No adhesive shall be applied to the faces of the plies.

5.4 Number of test specimens

A set of five specimens shall be tested. When testing materials that are suspected of being anisotropic, sets of test specimens shall be prepared having axes parallel to and normal to the suspected direction of anisotropy.

5.5 Conditioning and temperature of test

The test specimens shall be conditioned at 23 ± 2 °C and 50 ± 5 % r.h. for not less than 16 h.

The test shall be carried out at 23 ± 2 °C immediately after conditioning.

5.6 Procedure

Determine the mean width and thickness of the test specimen to within 0.1 mm using method 1A. Where the width or thickness of any specimen varies by more than 1.5 mm along the length, reject the specimen.

Place the test specimen symmetrically across the supporting surfaces so that any plies are normal to the plane of contact. Apply an increasing force with the loading bar acting on the specimen at a speed of 100 ± 2 mm/min.

Record the maximum force F (in N) to an accuracy of ± 1 %.

5.7 Calculation of results

Calculate the cross-breaking strength of the specimen C_b (in kPa) from the following equation:

$$C_b = \frac{1500FL}{BD^2}$$

where

- F is the maximum force (in N);
- B is the width of the specimen (in mm);
- D is the thickness of the specimen (in mm);
- L is the distance between the lines of contact of the supports (in mm).

Take the arithmetic mean of the cross-breaking strengths of the five test specimens as the cross-breaking strength of the material under test.