

Methods of test for

Rigid cellular materials —

Part 3: Methods 12 and 13

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- British Plastics Federation
- British Railways Board
- British Rigid Urethane Foam Manufacturers' Association
- British Rubber Manufacturer's Association
- Department of the Environment (Building Research Establishment)
- Furniture Industry Research Association
- Furniture, Timber and Allied Trades Union
- Ministry of Defence
- National Bedding Federation
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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under the direction of the Plastics and Rubber Standards Committees and is a revision of BS 4370-3:1974, which is withdrawn. The methods of test described here are intended to apply to rigid cellular products of polymeric origin, but they are not necessarily suitable for testing cellular materials of inorganic origin.

In this revision the method for the measurement of heat distortion temperature (formerly method 11) has been withdrawn. Method 12 has been amended to use less cumbersome and less noisy equipment. Method 13 has now been aligned with method A of the corresponding international standard ISO 4897.

Many rigid cellular products and test specimens are not isotropic. This is usually ascribed to the fact that the cells in the material 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.

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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 Scope

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

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

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

2 Method 12. Determination of friability

2.1 General

This method measures friability as the degree of disintegration of rigid cellular plastics calculated as the percentage mass loss, when subjected to a grinding process under specified conditions.

2.2 Apparatus

2.2.1 Ball mill, comprising a cylindrical polyethylene container of internal dimensions 90 ± 1 mm long and 260 ± 3 mm in diameter (see Figure 1), into which are inserted 3.8 ± 0.1 kg (i.e. approximately 400) smooth porcelain balls each 19.0 ± 1.0 mm in diameter, and a means of rotating the container with its longitudinal axis horizontal at a rate of 62 ± 2 r/min.

NOTE 1 A suitable container may be constructed from polyethylene pipe of outside diameter 280 mm. Figure 2 shows an example of a suitable practical arrangement.

NOTE 2 Because of the high level of noise inherent with this apparatus, a sound enclosure is recommended.

2.2.2 Balance, reading to an accuracy of 1 mg.

2.2.3 Stop watch or stop clock, reading to an accuracy of 1 s.

2.3 Test specimen

The test specimen shall be a cube of side 20 ± 1 mm. The test specimen shall be free from surface skins. All debris remaining on the test specimen shall be removed using a vacuum cleaner. If required, the removal of debris from the specimen shall be assisted by an air jet which does not damage the specimen. Methods of specimen preparation employing heat (e.g. hot-wire cutting) shall not be used.

2.4 Number of test specimens

Four test specimens are required for each test. Three tests shall be carried out.

2.5 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 tests shall be carried out immediately after conditioning.

2.6 Procedure

Determine the mass of the set of four test specimens to the nearest 1 mg.

Load the set of four specimens into the ball mill and secure the lid.

Run the apparatus for 60 revolutions of the polyethylene container.

Carefully remove the test specimens from the polyethylene container.

Remove any debris from the specimens using a vacuum cleaner, assisting the process, if necessary, by using an air jet which does not damage the specimens.

Redetermine the mass of the set of test specimens to the nearest 1 mg.

If by visual inspection any of the four test specimens appear to have been non-uniformly abraded, or if a specimen breaks, abandon the test and prepare new test specimens.

Clean the equipment after carrying out six tests, or earlier if the container and balls become visibly contaminated. Do this by covering the balls with water, adding approximately 20 g of mild abrasive powder and grinding for at least 1 h. Rinse the container and balls thoroughly and dry them before re-use.

2.7 Calculation of results

Calculate the friability F (in %) of the set of test specimens using the following equation:

$$F = 100 \times \frac{M_o - M_t}{M_o}$$

where

M_o is the original mass of the set of test specimens (in g);

M_t is the final mass of the set of test specimens (in g).

Calculate the mean friability (in %) of the material from the values obtained for the three tests.

2.8 Test report

The test report shall include the following information:

- the description and identity of the material;
- the friability of each set of test specimens (in %);
- the mean friability calculated from the values obtained for the three tests (in %);
- any deviation from the procedure described in this method;
- the method used, i.e. method 12 of BS 4370-3:1988.