

Methods of testing

Refractory materials —

Part 6: Ceramic fibre products

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- Association of Manufacturers of Domestic Electrical Appliances
- British Ceramic Research Association
- British Steel Industry
- Combustion Engineering Association
- Electricity Supply Industry in England and Wales
- Eurisol (UK) Association of Manufacturers of Mineral Insulation Fibres
- National Coal Board
- Refractories Association of Great Britain

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Foreword

This Part of BS 1902 has been prepared under the direction of the Refractory Products Standards Committee.

It supersedes DD 41:1982 which is withdrawn. Attention is drawn to the guidance on installation and use of ceramic fibre materials given in BS 6466.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 20, 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.

Section 1. General

1.1 Scope

This Part of BS 1902 describes methods of test for ceramic fibre products which are used as heat insulating materials at temperatures in the range from 1 000 °C to 1 600 °C. Typical products covered by this standard are loose fibres, blankets, felts, papers and boards. The test methods and their applicability to each product type are shown in Table 1.

An example of how to calculate a cooling correction, necessary when calculating specific heat capacity, is given in Appendix A.

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

1.2 Designations

The test methods applicable to each type of ceramic fibre product are referred to by the designations given in Table 1.

1.3 Sampling

NOTE Although there are well established procedures for the selection of samples for quality control purpose where the units are of similar type, size and shape, it is not practicable to apply such methods to many consignments of ceramic fibre products, because of their diversity. It is necessary to adapt the method of sampling to the type of product in question.

Sampling becomes difficult when the consignment consists of relatively small quantities of materials of different types and physical properties, and it may be necessary to restrict the size of samples in such cases to avoid the destructive testing of too large a proportion of each subportion of the consignment.

1.3.1 Selection of samples

Samples shall only be taken from unbroken packages or from undamaged units.

NOTE 1 As far as possible, samples should be representative of each material in the consignment.

NOTE 2 Where the consignment comprises more than one type of fibre product and/or more than one thickness or density, each type, each thickness and each density should be treated as a separate consignment for the purposes of sampling, unless another arrangement is made between the purchaser and the vendor.

NOTE 3 The properties of rolls of fibre blanket, particularly thickness and bulk density, are known to vary across the width of the roll and sampling should reflect this.

The samples shall be selected as follows.

- a) *Blanket, felt and paper.* A strip shall be cut across the full material width from the middle and each end of randomly selected rolls.
- b) *Board type products.* Each randomly selected board shall be considered to be a sample.
- c) *Uncompressed bulk fibre.* Each selected bag or box shall be sampled at a fixed depth and the samples combined to give a representative sample.
- d) *Compressed bulk fibre.* This shall be sampled in accordance with ASTM D1060-85 and the individual samples combined to give a representative sample.

1.3.2 Size of samples

The minimum sample sizes, and the rate of additional sampling required above this minimum, shall be as given in Table 2.

Each sample shall contain a sufficient number of units to permit random selection of test pieces for each test.

NOTE Although statistically the minimum size of sample required is not dependent on the size of the batch being sampled, it is usually convenient to base a sampling schedule to some extent on the size of the consignment. The sample will also vary in size according to the number of tests which are to be carried out.

1.3.3 Preparation of test pieces

1.3.3.1 Blanket, felt, paper and board. Cut the required number of test pieces of the required dimensions, using a template and sharp knife. Avoid excess pressure on the template as this may crush the fibre.

NOTE Any pressure applied to the template should not exceed that given in the relevant method described in section 2.

1.3.3.2 Bulk fibres. Subdivide using a core sampler in accordance with ASTM D1060-85.

Table 1 — Summary of test methods and designations, applicability to product types, and numbers of samples required

Section	Test	Material	No. of test pieces	Designation
2	Thickness: 725 N/m ² method	Blanket Felt		Method 1902-602/1
	50 kN/m ² method	Paper Board		Method 1902-602/2
3	Moisture and total organic content	All products	3	Method 1902-603
4	Actual bulk density	Blanket Felt Paper Board	3	Method 1902-604
5	Shrinkage: slow heat method	Blanket Felt Paper Board	3	Method 1902-605/1
	hot furnace method	Blanket Felt Paper Board	3	Method 1902-605/2
6	Thermal conductivity: calorimetric method up to hot face temperature of 1 300 °C	All products	1	Method 1902-606/1
	calorimetric method up to hot face temperature of 1 000 °C	All products	1	Method 1902-606/2
	high temperature guarded hot plate method up to a hot face temperature of 1 200 °C	All products	2	Method 1902-606/3
	hot wire method up to a hot face temperature of 1 500 °C	All products	1	Method 1902-606/4
7	Shot content	All products	3	Method 1902-607
8	Compressibility and resilience	Blanket Felt	3	Method 1902-608/1
		Loose fibre		Method 1902-608/2
9	Tensile (parting) strength	Blanket Felt Paper	10	Method 1902-609
10	Specific heat capacity	All products	2	Method 1902-610

Table 2 — Sample sizes and rates of additional sampling

Material	Minimum size of sample	Rate of additional sampling
Uncompressed and compressed bulk fibre	2 kg	0.5 kg per 1 000 kg, above first 5 000 kg
Blankets, felts, paper and board	5 units	1 unit per 200 units

Section 2. Measurement of thickness

2.1 General

The following methods shall be used for determining the thickness of blankets, felts, papers and boards:

- a) the 725 N/m^2 method (see 2.2) for blankets and felts;
- b) the 50 kN/m^2 method (see 2.3) for papers and boards.

2.2 The 725 N/m^2 method

2.2.1 Apparatus

2.2.1.1 Thickness gauge (see Figure 1), comprising a square base plate (A) having a level surface and a vertical pillar (B) on one of its sides. The pillar supports a horizontal beam (C) on which is mounted a dial gauge (D) capable of measuring up to $30 \pm 0.1 \text{ mm}$. The distance between the pillar and the dial gauge shall be adjustable, so that every part of the specimen can be measured.

The horizontal beam can be moved both vertically and horizontally after slackening clamping screws E and F.

The spindle in the dial gauge is fitted with a small pan on its upper end and a disc $75 \pm 1 \text{ mm}$ in diameter on the lower end. A weight (G) is placed on the pan so that the total mass of spindle, pan, disc and weight applies a pressure of $725 \pm 15 \text{ N/m}^2$ when allowed to rest on top of the sample.

2.2.1.2 Gauge block, consisting of a block of metal $25 \pm 0.1 \text{ mm}$ thick with parallel machined faces, which is used as a calibration slip gauge.

2.2.2 Procedure

Brush the base plate free of any residual material and align the disc so that it lies parallel to the base plate and, when they are in contact, the dial gauge reads zero.

For samples greater than 25 mm thick, place the slip gauge on the base plate and raise the height of the dial gauge so that, when the disc is touching the upper machined surface of the gauge block, the reading is zero. Once set, remove the gauge block.

Gently raise the disc and slide the sample underneath it. Slowly lower the disc on to the sample until it supports the full pressure of the disc and weight. Record the dial reading.

Repeat the measurement on at least two other positions, measuring to an accuracy of 0.1 mm .

2.2.3 Expression of results

Record the thickness measured and calculate the mean of the measurements. Express the mean to the nearest 0.5 mm .

NOTE On samples which are greater than 25 mm thick and the slip gauge has been used, add 25 mm to the measured result.

2.3 The 50 kN/m^2 method

Carry out the test in accordance with 2.2 except that the diameter of the disc on the thickness gauge (2.2.1.1) shall be $12.5 \pm 0.5 \text{ mm}$ and the weight shall be adjusted to apply a pressure of $50 \pm 1 \text{ kN/m}^2$.

2.4 Test report

The test report shall contain the following information:

- a) the name of the testing establishment;
- b) the date of the test;
- c) a reference to these methods of test, i.e. "determined in accordance with methods 1902-602/1 or /2", as appropriate (see 1.2);
- d) the fibre type;
- e) the material or product form;
- f) the individual results for each sample, and the mean.