BRITISH STANDARD

BS 3958-5: 1986

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Thermal insulating materials —

Part 5: Specification for bonded man-made mineral fibre slabs

UDC 662.998:677.52 – 412

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Refrigeration, Heating and Air Conditioning Standards Committee (RHE/-) to Technical Committee RHE/9, upon which the following bodies were represented:

British Ceramic Research Association
British Gas Corporation
Chartered Institution of Building Services Engineers
Combustion Engineering Association
Cranfield Institute of Technology
Department of Health and Social Security
Department of the Environment (Building Research Establishment)
Department of Trade and Industry (National Physical Laboratory)
Electricity Supply Industry in England and Wales
Engineering Equipment and Materials Users' Association
Eurisol (UK) Association of Manufacturers of Mineral Fibre Insulation
Gypsum Products Development Association
Institution of Gas Engineers
Phenolic Foam Manufacturers' Association
Refrigeration Industry Board
Royal institute of British Architects
Structural Insulation Association
Thermal Insulation Manufacturers and Suppliers Association (TIMSA)
Thermal Insulations Contractors' Association
Water-tube Boilermakers' Association

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Albury Laboratories Limited
British Rubber Manufacturers' Association
Calcium Silicate Brick Association Limited
Institute of Refrigeration
Institution of Mechanical Engineers
Yarsley Technical Centre Ltd.

This British Standard, having been prepared under the direction of the Refrigeration, Heating and Air Conditioning Standards Committee, was published under the authority of the Executive Board and comes into effect on 28 November 1986

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The following BSI references relate to the work on this standard:
Committee reference RHE/9
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Contents

Foreword

This revision of this Part of BS 3958 is one of a series published under the direction of the Refrigeration, Heating and Air Conditioning Standards Committee to specify requirements for a particular range of insulating materials. It supersedes the 1969 edition which is withdrawn.

The four classification groups of materials, similar to those specified in the 1969 edition, have been retained although in this revision the basis of the classification is that of thermal conductivity, not of density. Thermal conductivity values have been reviewed and generally improved. The format and presentation of this revision has also been aligned with other recently published Parts of this standard.

Other Parts of BS 3958 are:

— *Part 1: Magnesia preformed insulation;*

— *Part 2: Calcium silicate preformed insulation;*

— *Part 3: Metal mesh faced man-made mineral fibre mattresses;*

— *Part 4: Bonded preformed man-made mineral fibre pipe sections;*

— *Part 6: Finishing materials; hard setting composition, self-setting cement and gypsum plaster.*

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 and ii, pages 1 to 4, 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 3958 specifies composition, moisture content, physical and chemical requirements, and sizes for bonded man-made mineral fibre slabs for thermal insulating purposes.

The material is classified into four groups according to its thermal conductivity and temperature range.

Information to be supplied when ordering is given in Appendix A.

This standard is not intended to cover materials used to insulate the fabric of buildings.

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

2 Definitions

For the purposes of this Part of BS 3958, the definitions given in BS 874, BS 2972 and BS 3533 apply.

3 Sampling and testing

Sampling and testing shall be in accordance with the appropriate clause in BS 2972.

Slabs shall be tested without an applied finish.

4 Composition

The insulation material shall be of man-made mineral fibre made from rock, slag or glass, processed from a molten state into a fibrous form, and shall be bonded together with a suitable thermosetting binder to form slabs.

Slabs shall not contain non-fibrous pieces of these materials that have any dimension exceeding 10 mm.

5 Moisture content

When conditioned at high humidity in accordance with **40.4** of BS 2972:1975, the moisture content of the material shall not exceed 5 % by mass.

6 Physical requirements

6.1 Thermal conductivity

When tested in accordance with the appropriate method of test for thermal conductivity given in BS 874 with a cold face not exceeding 50 °C, the measured thermal conductivity shall not exceed the values given in Table 1, for the appropriate group.

Table 1 — Thermal conductivity values

Mean temperature	Thermal conductivity			
	Group 1	Group 2	Group 3	Group 4
°C	W/(m·K)	W/(m·K)	W/(m·K)	W/(m·K)
50	0.048	0.043	0.043	0.044
100	0.065	0.052	0.050	0.052
150	0.089	0.065	0.060	0.060
200	0.123	0.080	0.072	0.068
250	—	0.104	0.084	0.077
300	—	—	0.102	0.088
350	—	—	—	0.100
400	—	—	—	0.115

Some products in a given thermal conductivity group may not, therefore, be capable of being used over the full temperature range indicated in Table 1 and the limiting temperature declared by the manufacturer shall be observed (see **6.4**).

Some products may be capable of exceeding the temperature range indicated in Table 1. In this case the manufacturer shall declare values of thermal conductivity at these higher temperatures.

NOTE The groups given in Table 1 are based on thermal conductivity values only. They are not density groups. However, for general guidance the density ranges associated with these thermal conductivity groups are usually as follows:

a) group 1: 15 kg/m^3 to 50 kg/m^3;

b) group 2: 30 kg/m^3 to 80 kg/m^3;

c) group 3: 50 kg/m^3 to 160 kg/m^3;

d) group 4: 140 kg/m^3 to 300 kg/m^3.

6.2 Bulk density

For any particular product, the variation from the manufacturer's declared value for bulk density, calculated at the nominal thickness and determined on full-size slabs shall not exceed ± 15 %.

NOTE The bulk density of the material will normally lie within the range 15 kg/m^3 to 300 kg/m^3. Materials of each group are made in a range of densities within this overall range, appropriate to the intended application.

6.3 Heat stability

When a sample is heated in accordance with **21.1** of BS 2972:1975 at the stated maximum limiting temperature of use, the material shall maintain its general form and not suffer visible deterioration of the fibrous structure.

NOTE Colour changes are not relevant.

6.4 Limiting temperature and thickness

The manufacturer shall state the maximum limiting temperature and limiting thickness at that temperature.

The material shall comply with the requirements of clause **18** of BS 2972:1975.

6.5 Recovery after compression

When tested by the method described in Appendix C, the recovery after compression shall be not less than 95 % of the original thickness.

6.6 Vibration settlement

When tested in accordance with clause **28** of BS 2972:1975 the settlement shall not exceed 2 %.

7 Fire classification

When tested in accordance with BS 476-11, the furnace temperature shall not rise by more than 50 °C, the specimen temperature shall not rise by more than 50 °C and the mean duration of sustained flaming shall not exceed 20 s.

NOTE Some organic matter may be present either in a fibrous form or as a bonding agent. It is suggested that the composition of the product be checked with the manufacturer for use in process conditions where organic matter may present a hazard, e.g. processes involving powerful oxidizing agents for thermal insulation of pipework and plant in a flammable atmosphere.

8 Chemical requirements

8.1 pH value of water extract

When tested by the method described in Appendix B, the pH value recorded shall be between 6.0 and 9.0.

8.2 Corrosive attack

The material shall not include significant quantities of substances that will promote corrosive attack on the surfaces with which it is to be in contact.

NOTE Water-soluble chlorides are normally present in trace quantities in most commercial thermal insulating materials. In the presence of moisture and oxygen and under certain adverse metallurgical conditions chloride ions are capable of initiating stress corrosion cracking in susceptible metal alloys such as austenitic stainless steels.

It is not practicable to indicate a safe upper limit for chloride content since water can leach out soluble chlorides from substantial volumes of insulating materials and allow them to be concentrated at the metal-insulation interface. In addition, water from outside sources can substantially increase the chloride content of the insulation.

In conditions potentially conducive to stress corrosion cracking, appropriate safeguards should be adopted (see **33.17** of BS 5970:1981).

Where necessary, trace quantities of water-soluble chlorides may be estimated in accordance with section 22 of BS 2972:1975.

9 Sizes of slabs

The range of slab sizes shall be as given in Table 2 (see also item b) of Appendix A).

NOTE Not all suppliers provide the full range of sizes. Slabs of different sizes from those specified in Table 2, but which are in accordance with this standard in other respects, may be available by arrangement with the manufacturer.

Table 2 — Size range of slabs

Length and width	Thickness
mm	mm
1 200 × 1 200 1 200 × 900 1 200 × 600 900 × 900 900 × 600 600 × 600	25, 40, 50, 75, or 100

10 Dimensional tolerances

The dimensions of mineral fibre slabs shall be in accordance with the nominal dimensions stated by the manufacturer (or supplier, as appropriate), subject to the following tolerances.

Length and width: ± 0.5 % or ± 5 mm, whichever is the greater.

Thickness: + 4 mm, – 2 mm.

11 External finish

The slabs shall have no applied external finish.

NOTE To suit particular applications, slabs having an applied finish on one or both faces, but which are in accordance with this standard in other respects, may be available by arrangement with the manufacturer (see item c) of Appendix A).

12 Marking

Each package of slabs or the slabs themselves, shall be clearly marked with the following:

a) the manufacturer's name, mark or symbol;

b) the manufacturer's type designation;

c) the nominal dimensions of the slab (length, width and thickness);

d) the number of slabs in the package, if applicable;

e) the number and date of this British Standard and the applicable thermal conductivity group, e.g. BS 3958-5:1986[1)], group 2.

[1)] Marking BS 3958-5:1986 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility.Enquiries as to the availability of third party certification should be addressed to the appropriate certification body.

Appendix A Information to be supplied when ordering

The following information should be supplied with the order:

a) the number and date of this British Standard, i.e. BS 3958-5:1986;

b) the dimensions of the slabs required (see clause **9**);

c) details of any applied finish, if required (see note to clause **11**);

d) a note of any unusual condition, e.g. of any acidic or alkaline fumes in the environment of the insulation, or of any other hazardous condition;

e) the maximum temperature to which the product will be subjected;

f) a note of any special degree of fire safety required, e.g. if the insulation is required to be non-combustible.

Appendix B Method of test for pH value of water extract

B.1 Preparation of sample

From the bulk sample, taken in accordance with BS 2972, cut five pieces, each of approximate mass 5 g, from separate units where possible. Disintegrate these pieces and mix thoroughly.

B.2 Determination of pH value of water extract

Weigh 2 g of the prepared sample and shake well for 10 min with 100 mL of distilled or deionized water (pH 6.5 to 7.5) at room temperature. Leave to settle for 5 min and decant the solution if necessary. Measure the pH of the mixture using a standard pH meter as specified in BS 3145. Repeat the test on a further 2 g of the sample and report both values.

Appendix C Determination of recovery after compression

C.1 Test specimens

Five test specimens shall be tested. Each shall be of the thickness supplied or a multiple of the thickness (by plying two or more pieces). The specimens shall be square with an edge length of 100 mm or twice the total thickness of the specimen, whichever is the greater.

C.2 Apparatus

C.2.1 *Compression testing machine* capable of recording simultaneously the thickness of the specimen and the load applied to it.

C.3 Procedure

Record the thickness of the specimen T_1 under a load of 30 N/m^2. Apply a load evenly distributed over the surface, that is either:

a) sufficient to reduce the specimen thickness to 75 % of the value T_1; or

b) a load of 40 kN/m^2, whichever is the smaller.

Leave the specimen under the load for 5 min.

Remove the load and allow the specimen to recover its thickness freely for 5 min.

Record the final thickness T_2 under a load of 30 N/m^2.

C.4 Calculation

Calculate the percentage recovery after compression from the expression:

$$\frac{T_2}{T_1} \times 100$$

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Publications referred to

BS 476, *Fire tests on building materials and structures.*

BS 476-11, *Method for assessing the heat emission from building materials.*

BS 874, *Methods for determining thermal insulating properties, with definitions of thermal insulating terms.*

BS 2972, *Methods of test for inorganic thermal insulating materials.*

BS 3145, *Specification for laboratory pH meters.*

BS 3533, *Glossary of thermal insulation terms.*

BS 3958, *Specification for thermal insulating materials*[2)].

BS 3958-1, *Magnesia preformed insulation.*

BS 3958-2, *Calcium silicate preformed insulation.*

BS 3958-3, *Metal mesh faced man-made mineral fibre mattresses.*

BS 3958-4, *Bonded preformed man-made mineral fibre pipe sections.*

BS 3958-6, *Finishing materials; hard setting composition, self-setting cement and gypsum plaster.*

BS 5970, *Code of practice for thermal insulation of pipework and equipment (in the temperature range of – 100 °C to + 870 °C).*

[2)] Referred to in the foreword only.

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