BRITISH STANDARD

BS 3958-4: 1982

CONFIRMED
DECEMBER 2007

Specification for

Thermal insulation materials —

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

UDC 662.998:677.522-462

Cooperating organizations

The Refrigeration, Heating and Air Conditioning Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following:

Association of Manufacturers of Domestic Electrical Appliances
Association of Consulting Engineers
Boiler and Radiator Manufacturers' Association Limited
British Combustion Equipment Manufacturers' Association
British Gas Corporation*
British Refrigeration and Air Conditioning Association*
Building Services Research and Information Association
Chartered Institution of Building Services*
Department of Energy Technology
Department of Health and Social Security*
Department of the Environment (PSA)
Electricity Supply Industry in England and Wales*
Heating and Ventilating Contractors' Association
Hevac Association
Institute of Energy
Institute of Refrigeration*
Institution of Gas Engineers*
Lloyd's Register of Shipping
Manufacturers' Association of Radiators and Convectors Ltd.
Ministry of Defence
National Coal Board
Society of British Gas Industries
Water-tube Boilermakers' Association*

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

Albury Laboratories Limited
Asbestos Cement Manufacturers' Association Limited
British Ceramic Research Association
British Rubber Manufacturers' Association
Combustion Engineering Association
Cranfield Institute of Technology
Department of Industry (National Physical Laboratory)
Department of the Environment (Building Research Establishment)
Department of the Environment (Housing and Construction)
Energy Industries Council
Engineering Equipment Users' Association
Eps Association
Eurisol (UK) Association of Manufacturers of Mineral Fibre Insulation
Fibre Building Board Development Organization Ltd.
Gypsum Products Development Association
Institution of Mechanical Engineers
Process Plant Association
Royal Institute of British Architects
Structural Insulation Association
Thermal Insulation Manufacturers' and Suppliers' Association (TIMSA)
Thermal Insulations Contractors' Association
Yarsley Testing Laboratories Ltd.
Coopted member

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 Board of BSI and comes into effect on 30 November 1982

First published March 1968
First revision November 1982

The following BSI references relate to the work on this standard:
Committee reference RHE/9
Draft for comment 80/74589

ISBN 0 580 12852 0

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

Foreword

This revision of this Part of this British Standard 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 1968 edition which is now withdrawn.

Mineral fibre insulation is not normally designed or recommended for the support of loads, therefore no test for compressive strength is included in this Part.

Other Parts of this standard are:

— *Part 1: Magnesia preformed insulation*;

— *Part 2: Calcium silicate preformed insulation*;

— *Part 3: Metal mesh faced mineral wool mats and mattresses*;

— *Part 5: Bonded mineral wool slabs (for use at temperatures above 50 °C)*;

— *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 this British Standard specifies composition, moisture content, physical and chemical requirements for bonded preformed man-made mineral fibre pipe sections, generally for use at elevated temperatures. Ceramic fibres are excluded.

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

2 References

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

3 Definitions

For the purposes of this Part of this British Standard, the definitions given in BS 874, BS 2972, BS 3533 and BS 5422 apply.

4 Sampling and testing

Sampling and testing shall be in accordance with the appropriate clause in BS 2972. For thermal conductivity determinations and for the assessment of fire hazard, a flat slab representative of the pipe section shall be used for the tests.

5 Composition

The 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 with a suitable binder.

6 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.

7 Physical requirements

7.1 Thermal conductivity. When tested in accordance with the appropriate method of test for thermal conductivity given in BS 874, the thermal conductivity shall not exceed the values given in Table 1.

Table 1 — Thermal conductivity values

Mean temperature	Thermal conductivity
°C	W/(m·K)
50	0.043
100	0.052
150	0.064
200	0.078
250	0.093
300	0.110
350	0.129

NOTE 1 BS 874 requires the test report to state which method of test was employed, the bulk density of the material, the hot face temperature and cold face temperature (generally within the range 10 °C to 50 °C), the conditioning procedure and the moisture content before and after the test.

NOTE 2 In order to comply with the requirements of Table 1, products of different bulk density may be supplied for use at different service temperatures. The required service temperature should be stated by the purchaser.

7.2 Bulk density. For any particular product, the variation from the manufacturer's declared value for bulk density, calculated at the nominal thickness, shall not exceed ± 15 %.

NOTE The bulk density of the material will normally lie within the range 50 kg/m^3 to 200 kg/m^3. The manufacturer's declared value for bulk density may vary with the size of section.

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

7.4 Temperature limitations. Not all products can give satisfactory service at high hot face temperatures. The manufacturer shall state the recommended maximum service temperature and limiting thickness.

8 Fire hazard (assessment of self-heating hazard)

The material shall comply with the requirements of **18.1** to **18.3** of BS 2972:1975 and with the requirements of **27.1** of BS 5422:1977, as appropriate.

9 Chemical requirements

9.1 Alkalinity. When tested by the method described in Appendix B, the pH value recorded shall be between 6.0 and 10.0.

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

NOTE 1 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 such as the process itself or wind-driven spray can substantially increase the chloride content of the insulation.

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

NOTE 2 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 organics may present a hazard, e.g. processes involving powerful oxidizing agents or thermal insulation on pipework and plant in a flammable atmosphere.

10 Standard shapes and sizes

10.1 Shape. Standard sections shall be cylindrical or semi-cylindrical. Very large diameters may be catered for by multi-segmental sections.

10.2 Sizes. The standard ranges of sizes shall be as follows.

Length:	0.5 m to 1.2 m
Diameter:	to fit standard pipes of external diameter up to 610 mm
Thickness:	19 mm to 120 mm.

NOTE 1 The full range of thicknesses may not be available for a specific pipe diameter; the thinner sections are generally only available for small diameter pipes.

NOTE 2 Not all suppliers provide the full range of standard sizes. Sections of other dimensions may be available by arrangement with the manufacturer.

11 Dimensional tolerances

Preformed pipe sections shall be in accordance with the nominal dimensions stated by the manufacturer (or supplier, as appropriate), subject to the following tolerances.

Length:	± 3 mm
Thickness:	± 3 mm
Uniformity:	the local thickness at any point shall not differ from the average thickness by more than 3 mm
Internal diameter:	– 0, + 1.5 mm (or + 1 %), whichever is the greater).

12 External finish

Sections shall be finished plain (no applied finish) or with one of the finishes given in Table 2.

Overlaps shall be as specified in Table 2.

NOTE Other finishes may be supplied by arrangement between the purchaser and the manufacturer.

13 Marking

Each package containing pipe sections, or the articles themselves, shall be clearly marked with the following:

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

b) the manufacturer's type designation, grade and maximum service temperature limit;

c) the nominal dimensions (length, thickness and internal diameter of the section);

d) the number of this British Standard, i.e. BS 3958-4[1)].

[1)] Marking BS 3958-4 on or in relation to a product is a claim by the manufacturer that the product has been manufactured in accordance with 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 to support such claims should be addressed to the Director, Quality Assurance Division, British Standards Institution, Maylands Avenue, Hemel Hempstead, Herts HP2 4SQ in the case of certification marks administered by BSI or to the appropriate authority for other certification marks.

Table 2 — Finishes and overlaps

Finish	Typical quality	Overlap	
		Longitudinal	End
Cotton scrim	Loomstate, weight 0.028 kg/m^2 min., texture warp 650, weft 400 threads/metre, min.	38 mm min.[a]	None
Cotton canvas	Loomstate, weight 0.1 kg/m^2 min., texture warp 1 850, weft 1 500 threads/metre min.	38 mm min.[a]	25 mm min.
Aluminium foil laminate	Foil thickness 0.008 mm min., glass fibre reinforced, paper laminated	38 mm min.[a]	None (sealing strip used)
Polyisobutylene sheet	Thickness 0.8 mm min.	38 mm min.[a]	25 mm min.

[a] May be reduced to 25 mm for sections up to 200 mm in circumference.

Appendix A Information to be supplied when ordering

The following information shall be supplied with the order:

a) the number of this British Standard, i.e. BS 3958-4;

b) the dimensions of the sections required;

c) the finish required;

d) the maximum service temperature to which the product will be subjected;

e) a note of any adverse condition in the environment of the insulation, e.g. acidic fumes;

f) a note of any special requirements concerning fire safety.

Appendix B Method of test for alkalinity

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. Crush these pieces and mix thoroughly.

B.2 Determination of pH. Weigh 2 g of the crushed 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 measure the pH of the mixture, using a standard pH meter (see BS 1647 and BS 3145) and decanting the solution if necessary. Repeat the test on a further 2 g of the sample and report both values.

Publications referred to

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

BS 1647, *pH scale.*

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 mineral wool mats and mattresses.*

BS 3958-5, *Bonded mineral wool slabs (for use at temperatures above 50 °C).*

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

BS 5422, *Specification for the use of thermal insulating materials.*

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.

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL