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BS 3958 : Part 3 : 1985
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British Standard Specification for

Thermal insulating materials

Part 3. Metal mesh faced man-made mineral fibre mattresses

Matériaux d'isolation thermique — Spécifications
Partie 3. Feutres-matelas en fibres minérales manufacturées cousus sur grillage

Wärmedämmstoffe
Teil 3. Kunstfasermatten mit Metallgewebeverkleidung für wärmedämmende Zwecke

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BSi
British Standards

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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 It supersedes the 1967 edition which is withdrawn.

Other Parts of BS 3958 are:

Part 1 Magnesia preformed insulation

Part 2 Calcium silicate preformed insulation

Part 4 Bonded preformed man-made mineral fibre pipe sections

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.

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Contents

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Specification

1 Scope

This Part of BS 3958 specifies composition, moisture content, physical and chemical requirements for man-made mineral fibre mattresses for thermal insulating purposes, faced on one or both sides with a flexible metal mesh.

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

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.

The metal facings and ties shall not be removed except where stated in the relevant clauses.

4 Composition

The insulation material shall be of man-made mineral fibre made from rock, slag or glass, and shall not contain non-fibrous pieces of these materials that have any dimension exceeding 10 mm.

NOTE. The fibres may be lightly bonded with a thermosetting binder, or may be treated with an oil dust-suppressant. See **9.2.**

5 Metal facings and ties

The mattress shall be suitably faced with woven wire mesh or expanded metal, and held together by wire or twine extending from one face to the other, spaced not more than 120 mm apart. The ties shall not become detached from the facings when pressure is applied over the surface of the mattress.

NOTE 1. The following materials are suitable facing materials and are normally available as standard products.

(a) *Woven wire mesh.* Mild steel, 25 mm mesh, 1.2 mm to 0.6 mm diameter wire, galvanized after weaving.

(b) *Expanded metal.* Mild steel, diamond shaped mesh 6 mm to 10 mm shortway of mesh (SWM), 0.45 mm thick strands, mass 1.22 kg/m^2, with or without galvanized finish.

NOTE 2. When required for use at high temperature suitable heat resistant facings and ties should be specified.

Particular attention is drawn to the limitations of galvanized finishes. See **33.17.1** of BS 5970 : 1981.

6 Moisture content

When conditioned at high humidity in accordance with **40.4** of BS 2972 : 1975, the moisture content of the materials 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	0.042
100	0.050
150	0.060
200	0.073
250	0.090
300	0.110
350	0.130

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 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.

NOTE 3. Not all products are designed to operate at the highest temperature in table 1; conversely, there are materials which can be used at higher temperatures; it is important, therefore, to take note of the manufacturer's declared maximum service temperature.

NOTE 4. In calculations of heat loss, only the thickness of the insulating material is relevant; where the metal facing is of substantial thickness, a suitable correction should be applied by subtracting the total thickness of the facings from the nominal thickness of the mattress. Metal ties of heavy gauge may also increase the conductivity of the mattress.

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, excluding metal facings and ties, will normally lie within the range 50 kg/m^3 to 150 kg/m^3.

7.3 Limiting temperature and thickness

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

7.3.2 The material shall comply with the requirements of **18.1** to **18.3** of BS 2972 : 1975.

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7.3.3 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.

7.4 Compressibility and resilience

When tested by the method described in appendix B, the thickness of the specimen whilst under pressure shall be not greater than the nominal thickness plus 3 mm. After removal of the pressure, the thickness shall be not less than the nominal thickness minus 3 mm.

NOTE. The objects of this test are to ensure that a mattress supplied at greater than nominal thickness is sufficiently compressible to be fitted at its nominal thickness and that a mattress is sufficiently resilient to recover its nominal thickness after being subjected to compression.

7.5 Vibration settlement

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

8 Fire classification

The mattress shall be non-combustible when tested in accordance with BS 476 : Part 4. For the purposes of this test, the metal facings and ties shall be removed.

NOTE 1. Attention is drawn to the requirements of **27.1** of BS 5422 : 1977.

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, thermal insulation on pipework and plant in a flammable atmosphere.

9 Chemical requirements

9.1 pH value of water extract

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

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.

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 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 **33.17** of BS 5970 : 1981).

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

10 Dimensional tolerances

10.1 Length and width

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

length and width: +15 mm, −10 mm for sizes up to 0.5 m
+3 %, −2 % for sizes over 0.5 m

10.2 Thickness

The thickness shall be not less than the nominal thickness minus 3 mm when measured by the method given in **6.1** of BS 2972 : 1975.

NOTE. As these materials can be compressed, they are often supplied at a thickness substantially in excess of nominal in order to ensure correct thickness after application.

11 Marking

Each package containing mattresses complying with this standard, or the articles themselves, shall be clearly marked with the following:

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

(b) manufacturer's type, designation and grade;

(c) dimensions;

(d) the number and date of this British Standard, i.e. BS 3958/3 : 1985*.

*Marking BS 3958/3 : 1985 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 to support such claims should be addressed to the Director, Quality Assurance Division, PO Box 375, Milton Keynes MK14 6LO for certification marks administered by BSI or to the appropriate authority for other certification marks.

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Appendices

Appendix A. Information to be supplied when ordering

The following information should be supplied when ordering:

(a) the number of this British Standard, i.e. BS 3958/3;

(b) the dimensions of the mattress required;

(c) the type of metal facing, e.g. woven wire mesh or expanded metal, as in clause **5**, or a special type of metal facing;

(d) whether the material is required faced on two sides or on one side only;

(e) the type of tie required, e.g. galvanized wire ties or a special type of tie to satisfy a particular requirement;

(f) a note of any unusual condition, e.g. of any acidic or alkaline fumes in the atmosphere around the insulation or of any other hazardous condition;

(g) the maximum temperature to which the product will be subjected.

Appendix B. Method of test for compressibility and resilience

B.1 Specimens

Cut five specimens, each 200 mm × 200 mm, from the mattress sample.

B.2 Procedure

Remove all facings and ties from a specimen and place the specimen on a flat horizontal surface. Place on it a flat, stiff platten of dimensions 300 mm × 300 mm and a mass of 0.5 ± 0.05 kg. Apply a 10 kg load (equivalent to 2600 N/m^2) centrally to the platten and, after 5 min, determine the thickness of the specimen by measurements at the four corners of the platten. Remove the load and the platten, allow the specimen to expand freely for 5 min, replace the platten and measure the final thickness at the four corners of the platten with a steel rule.

Appendix C. Method of test for pH value of water extract

C.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.

C.2 Determination of pH value of water extract

Weigh 2 g of the 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 to BS 3145. Repeat the test on a further 2 g of the sample and report both values.

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Publications referred to

BS 476	Fire tests on building materials and structures
	Part 4 Non-combustibility test for 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
	Part 1 Magnesia preformed insulation
	Part 2 Calcium silicate preformed insulation
	Part 4 Bonded preformed man-made mineral fibre pipe sections
	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
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 −100 °C to +870 °C)

*Referred to in the foreword only.

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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:

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