

Specification for

Pressboard for electrical purposes

UDC 621.315.614.65:676.277

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

Co-operating organizations

The Electrical Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

- Associated Offices Technical Committee
- Association of Consulting Engineers
- Association of Manufacturers of Domestic Electrical Appliances
- Association of Mining Electrical and Mechanical Engineers
- Association of Supervisory and Executive Engineers
- British Electrical and Allied Manufacturers' Association*
- British Electrotechnical Approvals Board for Household Equipment
- British Non-Ferrous Metals Federation
- British Radio Equipment Manufacturers' Association
- British Railways Board
- British Steel Corporation
- Crown Agents for Oversea Governments and Administrations
- Department of Energy
- Department of the Environment
- Department of Prices and Consumer Protection*
- Electric Cable Makers' Confederation
- Electrical Contractors' Association
- Electrical Contractors' Association of Scotland
- Electrical Research Association*
- Electricity Supply Industry in England and Wales*
- Electronic Engineering Association*
- Engineering Equipment Users' Association
- Health and Safety Executive, HM Factory Inspectorate
- Institution of Electrical Engineers
- Institution of Electrical and Electronics Technician Engineers
- Lighting Industry Federation Limited
- Ministry of Defence*
- National Inspection Council for Electrical Installation Contracting
- Oil Companies Materials Association
- Post Office*
- South of Scotland Electricity Board

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- Adhesive Tape Manufacturers' Association
- British Electro-Ceramic Manufacturers' Association
- British Paper and Board Industry Federation (PIF)
- British Plastics Federation
- Department of Industry — National Physical Laboratory
- Electrical and Electronic Insulation Association (BEAMA)
- Electrical Installation Equipment Manufacturers' Association (BEAMA)
- Glass Textile Association
- Power Generation Association (BEAMA)
- Radio and Electronic Components Manufacturers' Federation
- Rotating Electrical Machines Association (BEAMA)
- Telecommunication Engineering and Manufacturing Association
- Transmission and Distribution Association (BEAMA)

This British Standard, having been approved by the Electrical Industry Standards Committee, was published under the authority of the Executive Board on 30 September 1975

© BSI 04-2000

First published December 1925
First revision June 1936
Second revision December 1950
Third revision August 1961
Fourth revision September 1975

The following BSI references relate to the work on this standard:
Committee references ELE/16, ELE/16/53, ELE/16/53/5
Draft for comment 72/26034 DC

ISBN 0 580 08516 3

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

	Page
Co-operating organizations	Inside front cover
Foreword	iii
1 Scope	1
2 References	1
3 Definitions	1
4 Classification	1
5 Composition	1
6 Finish	1
7 Thickness	1
8 Density	2
9 Electric strength proof test	2
10 Tensile strength	2
11 Compressibility	2
12 Shrinkage	2
13 Flexibility	3
14 Cohesion between plies	3
15 Oil absorption	3
16 Machineability	3
17 Conductivity of aqueous extract	3
18 pH value of aqueous extract	3
19 Moisture content	4
20 Mineral ash	4
21 Freedom from conducting particles	4
22 Conductivity of organic extract	4
Appendix A Conditioning of test pieces	5
Appendix B Drying of test pieces	5
Appendix C Measurement of thickness	5
Appendix D Determination of density and oil absorption	5
Appendix E Electric strength proof test	6
Appendix F Tensile strength	6
Appendix G Compressibility	7
Appendix H Shrinkage	9
Appendix J Flexibility	9
Appendix K Cohesion between plies	10
Appendix L Conductivity of aqueous extract	10
Appendix M pH value	11
Appendix N Moisture content	11
Appendix P Mineral ash	11
Appendix Q Freedom from conducting particles	11
Appendix R Conductivity of organic extract	11
Figure 1 — Electric strength proof test in air at 90 °C	13
Figure 2 — Electric strength proof test in oil at 90 °C	14
Figure 3 — Electrode arrangement for electric strength test	15
Figure 4 — Compression test apparatus	16
Figure 5 — Diagrammatic arrangement of apparatus for test for conducting particles	16
Figure 6 — Conductivity cell for organic extract	17
Table 1 — Nominal thickness	2

	Page
Table 2 — Density	2
Table 3 — Tensile strength	2
Table 4 — Compressibility	2
Table 5 — Shrinkage in air	2
Table 6 — Flexibility	3
Table 7 — Oil absorption	3
Table 8 — Conductivity of aqueous extract	3
Table 9 — pH value of aqueous extract	3
Table 10 — Drying period	5
Publications referred to	18

Foreword

This revision, prepared on the basis of information supplied by the Electrical Research Association, uses SI units and modifies the requirements on conditioning atmosphere in accordance with international agreement. A series of preferred nominal thicknesses is included for the first time.

With wider use of air-conditioned rooms and buildings which are normally at a higher temperature than 20 °C, there has been increasing support for a proposal made in various industries and technologies that the controlled atmosphere for use before and during testing should be at a temperature of 23 ± 2 °C and a relative humidity of 50 ± 5 %. Technical Committee 15, Insulating materials, of the International Electrotechnical Commission has accepted these conditions and they are accordingly included in this revision.

The definition of pressboard is substantially in agreement with international proposals, although it should be noted that internationally the difference between “paper” and “board” is by “grammage” (mass per unit area) whereas the electrical industry regards paper as being produced by a continuous process and board as being produced by an intermittent machine.

The requirements and methods of test for the various properties remain the same as in the previous edition because in these tests the change in controlled atmosphere does not have any significant effect on the results.

Specifications for other materials of a similar nature are given in BS 3255 “*Presspaper for electrical purposes*” and BS “*Laminated pressboard for electrical purposes*”.¹⁾

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

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 18, 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⁾ In course of preparation.

1 Scope

This British Standard specifies test requirements and preferred nominal thicknesses for four types of pressboard, either dyed or of natural colour, having a calendered finish. The range of nominal thickness of each type is:

Type A	from 0.8 mm to 2.0 mm
Type B	from 0.8 mm to 4.5 mm
Type C and D	from 0.8 mm to 6.0 mm

NOTE Type D is also available with a glazed finish and all types are available with a matt (i.e. uncalendered) finish when specified by the purchaser. Tests and limits for pressboard with these finishes should be agreed between the purchaser and the supplier.

Material made by combining several thicknesses of pressboard, using an adhesive, is not covered by this standard. BS . . . *"Laminated pressboard for electrical purposes"* is in course of preparation.

Material produced on a continuous machine is not excluded provided it meets all the requirements of the specification.

2 References

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

3 Definitions

For the purposes of this British Standard the following definitions apply.

3.1 pressboard

board made from pulp of entirely natural vegetable origin and of high chemical purity, normally on an intermittent board machine, and afterwards subjected to pressure to remove excess water, consolidate the plies and "close up" the material, thus producing the board which is then dried and calendered

3.2 machine direction

the direction in the plane of the board corresponding to the direction of the flow of the stuff on the machine

3.3 cross direction

the direction in the plane of the board at right angles to the machine direction

4 Classification

The four types of pressboard specified in this British Standard are as follows.

Type A. A dense pressboard of high chemical purity, having good electrical and mechanical properties, intended for use in commonly-used refrigeration coolants and in air.

This type is usually made from 100 % cotton.

Type B. A dense pressboard having good electrical and mechanical properties combined with flexibility and suitable for use in air or oil.

This type is usually made from 100 % cotton.

Type C. A soft porous pressboard with greater oil absorption than type D and type B. It has good electrical properties in oil and is intended primarily for use in that medium.

This type is usually made from a mixture of cotton and other fibres such as jute and chemical wood pulp.

Type D. A hard pressboard more rigid than types A, B and C and characterized by good mechanical properties.

This type is generally described as presspahn and is usually made from chemical wood pulp.

5 Composition

Pressboard of any type shall be made entirely from vegetable fibre and, where necessary, a suitable dye, and shall be free from extraneous matter. The board shall be produced without the addition of any adhesive.

NOTE When pressboard of any kind is intended for use in air, suitable precautions should be taken to prevent absorption of moisture.

6 Finish

The pressboard shall be flat and have a smooth calendered finish.

7 Thickness

The thickness shall be determined as described in Appendix C and shall not differ at any point from the nominal thickness by more than $\pm 5\%$.

In cases of doubt or dispute, the method given in C.2 shall be used to determine the thickness.

The preferred nominal thicknesses are detailed in Table 1.

Table 1 — Nominal thickness

Preferred nominal thickness		
Type A	Type B	Types C and D
mm	mm	mm
0.8	0.8	0.8
1.0	1.0	1.0
1.5	1.5	1.5
2.0	2.0	2.0
	3.0	3.0
	4.5	4.5
		6.0

8 Density

The density shall be determined by the method described in Appendix D and shall be as detailed in Table 2.

Table 2 — Density

Type	Density	
	minimum	maximum
	kg/m ³	kg/m ³
A	1 150	—
B	1 100	—
C	900	1 150
D	1 100	—

9 Electric strength proof test

The electric strength proof test shall be applied as follows.

Type A in air

Type B in air or oil as agreed between the supplier and the purchaser

Type C in oil

Type D in air or oil as agreed between the supplier and the purchaser

9.1 Test in air. The test is applicable to material not exceeding a nominal thickness of 3.0 mm.

The test shall be made in accordance with Appendix E and the specimen shall withstand for 1 min the proof voltage appropriate to the nominal thickness read from Figure 1. There shall be no sign of steaming or smoking.

9.2 Test in oil. The test shall be made in accordance with Appendix E and the specimen shall withstand for 1 min without failure the proof voltage appropriate to the nominal thickness read from Figure 2.

10 Tensile strength

The tensile strength in the machine direction and in the cross direction shall be determined as described in Appendix F, and shall be not less than the appropriate values detailed in Table 3.

Table 3 — Tensile strength

Type	Minimum tensile strength	
	Machine	Cross
	MPa	MPa
A	62.0	31.0
B	65.5	27.6
C	48.3	24.1
D	69.0	34.5

11 Compressibility

The compressibility shall be determined as described in Appendix G, and shall not exceed the appropriate value given in Table 4.

Table 4 — Compressibility

Type	Compressibility in air after 1 min	Total compressibility after subsequent immersion in hot oil for 24 h
	%	%
A	10	—
B	10	14
C	13	20
D	8	12

12 Shrinkage

12.1 In air. The shrinkage due to drying in air shall be determined as described in Appendix H and shall not exceed the appropriate value given in Table 5.

Table 5 — Shrinkage in air

Type	Maximum shrinkage		
	Machine direction	Cross direction	Thickness
	%	%	%
A	1.0	1.5	4.0
B	1.0	1.5	4.0
C	1.0	1.5	4.0
D	1.0	1.5	6.0

12.2 In oil. The shrinkage in oil of the dried test pieces of types B, C and D shall be determined as described in Appendix H and shall not exceed 0.3 % in the machine direction or cross direction and 1.0 % in thickness.