

Specification for

Phenolic laminated sheet and epoxy cotton fabric laminated sheet

Committees responsible for this British Standard

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- British Paper and Board Industry Federation
- ERA Technology Ltd.
- EEA (The Electronics and Business Equipment Association)
- Electrical and Electronic Insulation Association (BEAMA Ltd.)
- Ministry of Defence
- Rotating Electrical Machines Association (BEAMA Ltd.)
- Society of British Aerospace Companies Ltd.

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Foreword

This British Standard has been prepared under the direction of the Plastics Standards Policy Committee and is based on data provided by the British Plastics Federation. It supersedes BS 5102:1974 and BS 2572:1976 which are withdrawn. Since the publication of BS 2572 in 1955 some of the types of phenolic laminated sheet covered in that standard have become obsolete and new types of laminate have been introduced. In drafting this standard consideration has been given to alignment with the work of the International Organization for Standardization (ISO), particularly with ISO 1642.

Phenolic laminated sheets have, in general, good machining properties, mechanical strength and electrical insulation properties. They are suitable for a wide range of mechanical and electrical applications.

Epoxy cotton fabric laminated sheets are similar to the corresponding phenolic cotton fabric type except that they have considerably lower water absorption, improved electrical properties and high resistance to electrical tracking.

This standard deals with phenolic resin bonded laminates in which the reinforcement consists of one of the following: asbestos felt, asbestos paper, asbestos cloth, cotton or cotton/synthetic fibre mixture fabric, cellulose paper or wood veneer. It also deals with one type of epoxy resin bonded laminate in which the reinforcement is a fine weave cotton fabric.

Phenolic resin bonded asbestos paper laminated sheets for electrical applications at power frequencies, formerly covered by BS 3253 (which has been withdrawn), are represented by type A5 in this standard.

Phenolic resin bonded paper laminates that are used specifically in the electrical industry were formerly covered by BS 5102. Phenolic resin bonded woven glass fabric laminated sheets are covered by BS 3953 and have not therefore been included in this standard.

The correspondence between the type designations in this edition and those in the 1976 edition and other standards dealing with laminated sheet is given in Table 1.

Table 1 — Relationship between types of laminated sheet specified in this standard and BS 2572:1976, BS 5102:1974 and ISO 1642

Types in this edition	Types in BS 2572:1976 (withdrawn)	Types in BS 5102:1974 (withdrawn)	Types in ISO 1642
A1	A1	—	PF AM 1
A2	A2	—	PF AP 1
A3	A3	—	—
A4	A4	—	PF AC 1
A5	A5	—	—
F1	F1	—	—
F2/1	F2/1	—	—
F6	F6	—	—
—	—	—	PF CP 2
P2	P2	3	—
P3/1	P3/1	5	—
W1	W1	—	PF WV 2
—	—	—	PF WV 1

Table 1 is only a general guide to the relationships between the types of laminated sheets in the various standards. In view of differences in limiting values, in test methods and in the ranges of properties covered, it should not be assumed that corresponding types are exact equivalents.

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 14, 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 British Standard specifies requirements for 20 types of phenolic laminated sheet and for one type of epoxy laminated sheet as classified in clause 3.

The ranges of thicknesses covered are as follows.

Types	Range of nominal thickness
	mm
A2, F2/1, F6	0.8 to 100
A1, A3, A4, W1, BW1, UW1	1.6 to 100
A5	0.4 to 25
F1	0.4 to 100
P2, P3/1	0.4 to 50

Requirements are included for phenolic resin bonded paper laminated sheet sanded on one side, of nominal thickness in the range 0.4 mm to 3 mm inclusive.

NOTE 1 It is permissible for sheet complying with this standard to contain additives, e.g. colouring matter.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

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

2.1

phenolic laminated sheet

sheet consisting of superimposed layers of paper, felt, fabric or veneer which have been coated or impregnated with a thermosetting phenolic resin and bonded together under heat and pressure

2.2

flatwise

perpendicular to the plane of lamination

2.3

edgewise

parallel to the plane of lamination

2.4

directions A and B

two directions in the plane of a sheet which are at right angles to each other. For fabric and wood based laminates these directions are related to the surface layer of fabric or wood veneer. One of these directions is parallel either to the warp threads of a fabric or to the grain of a wood veneer. For paper or felt reinforced sheet, one of these directions is parallel to the edge of the sheet

2.5

epoxy bonded cotton fabric laminated sheet

sheet consisting of layers of cotton fabric which have been impregnated with a thermosetting epoxy resin and bonded together under heat and pressure

3 Classification

3.1 General

For the purposes of this British Standard laminated sheets are classified as described in 3.2 and 3.3.

3.2 Class 1

3.2.1 General

Sheets in which the mechanical properties in directions A and B are of the same order. Any assessment of the mechanical strength of a sheet of this class is based upon the lower of the values corresponding to these two directions. Such sheets are intended to be used without consideration of directions A and B.

The sheets of this class are divided in accordance with their composition into four groups A, F, P and W, with subdivision into types, as described in 3.2.2 to 3.2.5.

3.2.2 Group A

Sheets with asbestos reinforcement comprising the following types.

Type	Reinforcement
A1	Asbestos felt
A2 and A5	Asbestos paper
A3 and A4	Woven asbestos cloth

NOTE 1 With woven asbestos cloth reinforcement the numbers of threads per unit length of warp and weft fall usually, but not necessarily, into the following ranges.

Type	Threads/cm
A3	7 to 20
A4	3 to 7

NOTE 2 All the types of asbestos reinforcement used in the manufacture of group A sheets contain up to 15 % of organic fibre, which is essential for the manufacture of these reinforcements.

NOTE 3 If using an asbestos material attention is drawn to the need to take account of the provisions of the Asbestos Regulations 1988. BS 7018 provides guidance on recommended procedures to minimize health hazards by controlling exposure at work to asbestos fibre which may be released from electrical insulating materials.