

Specification for

Thin PVC sheeting (calendered, flexible, unsupported)

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

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- British Plastics Federation*
- Chemical Industries Association
- Department of the Environment — Building Research Establishment
- Department of Industry
- Electrical and Electronic Insulation Association
- Electrical Installation Equipment Manufacturers' Association
- Electrical Research Association*
- Engineering Equipment Users' Association
- Ministry of Defence*
- Plastics Institute
- Post Office
- Royal Institute of British Architects
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- Rubber and Plastics Research Association of Great Britain*
- Society of Motor Manufacturers and Traders Ltd.*

The 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.

- Consumer Standards Advisory Committee of BSI
- Packaging and Industrial Films Association
- PIRA (Research Association for the Paper and Board, Printing and Packaging Industries)
- Retail Trading Standards Association
- Telecommunication Engineering and Manufacturing Association

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Foreword

This British Standard, prepared under the authority of the Plastics Industry Standards Committee, is one of a series for flexible polyvinyl chloride materials. It was first published in 1951 and subsequently revised in 1956 and 1967.

The standard is based on technical data provided by the British Plastics Federation. Other standards in the series are:

BS 1774, *Rainwear from PVC sheeting*.

BS 1776, *Fabrication of lightweight articles (other than rainwear) from polyvinyl chloride sheeting*.

BS 2739, *Thick PVC sheeting (calendered, flexible, unsupported)*.

BS 3878, *Flexible PVC sheeting for hospital use*.

In this revision the principal change is in the use of metric units. Clauses 11 to 12 in the 1967 edition have been deleted as they were considered to be superfluous.

During 1973-4 several discussions took place in the Executive Board of BSI as a result of concern about potential fire hazards involved in the rapidly increasing use of many polymeric materials, especially for furnishing and construction purposes. Issues of great public importance were involved, relating in particular to the use of laboratory fire tests to define quality requirements, in view of the general lack of correlation between the results obtained in such small-scale tests and the fire performance of materials and products in actual conditions of use.

The Executive Board decided that a detailed review of all the issues involved should be carried out as a matter of urgency, and that this should be comprehensive in scope rather than limited to polymeric materials. For this purpose an authoritative Co-ordinating Committee on Fire Tests was established. In the meantime certain general principles were laid down regarding the terminology and approach to be adopted in immediate revisions and amendments of the British Standards involving small-scale fire tests.

In keeping with this policy the type designations and descriptions in this standard have been changed to avoid using the reference "F" and the term "flame resistant", which might be misinterpreted as applying to situations other than those of the specified test conditions.

The principle of statistical control of certain properties has been retained, as it has been shown by experience that the variability of results both within the material itself and from certain test methods is such that very low single-level limits would need to be specified if satisfactory material was not to be rejected.

The value of statistical control to the purchaser is as follows.

- a) It gives an assurance that in a sequence of samples tested, only occasional samples will have a quality as represented by the specified limit (L) for single samples and that over a period the average quality will be at least as good as the specified limit ($\bar{X}$) for a large number of samples. In practice the ($\bar{X}$) limits can be, and frequently are, exceeded in individual manufacturing "batches".
- b) In the long run, differences of quality will be readily distinguished and relatively small trends will be detected.
- c) Control chart or other statistical control techniques can be applied whereby test data obtained by the purchaser can be effectively compared with the much greater amount of data obtained by the manufacturer, if appropriate arrangements are made to do so.

Those purchasers of PVC sheeting for whom it would be inconvenient to carry out sampling and testing on their own account may wish to rely on the independent assurances of the BSI Certification Trade Mark.

By the application of this principle, it is intended to bring about a general improvement in quality of material complying with the requirements of this standard. Further details of the principle are given in the notes to the appropriate clause.

The lower thickness limit of 100 μm has been removed, as there is no reason why, provided the remaining requirements of this standard are satisfied, thinner sheetings should not be used for many applications quite satisfactorily, and indeed they are being so used.

It will be noted that the thickness range of this standard overlaps that of BS 2739. This is because the uses of thin and thick sheetings have been shown to require these thickness ranges and, in the overlapping region, thickness is not the feature determining the suitability of the sheeting.

The test method for extensibility after heat ageing is known not to be entirely reliable and a new method is being developed. It is hoped to issue an appropriate amendment in due course.

Consideration has been given to providing a means whereby the readiness with which sheeting can be welded could be assessed, but attempts to produce a laboratory test which measures this property have failed, due to the wide variation in electrode systems, machines and techniques in common usage.

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 16, 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 applies to flexible unsupported thin calendered PVC sheeting in the nominal thickness range up to and including 400 μm , complying with the appropriate requirements of clauses 4 to 11 and Table 1 to Table 4, and classified as follows:

- Type 1A General purpose unprinted single or laminated thin sheeting with a plain or embossed surface
- Type 2A Thin sheeting of type 1A, printed.
- Type 1B Unprinted single or laminated thin sheeting with a plain or embossed surface complying with the requirements for distance of travel of flame given in Table 2.
- Type 2B Thin sheeting of type 1B, printed. It does not apply to transparent polished sheeting, often referred to as “glass-clear” sheeting.

NOTE Odd numbers in the type references apply to unprinted sheeting and even numbers to printed sheeting in this British Standard and in BS 2739.

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

thin sheeting

calendered flexible, unsupported PVC sheeting in the nominal thickness range up to and including 400 μm

NOTE The term “film” is sometimes used in a general sense in commerce to mean unsupported thin sheeting at the lower end of the range of thickness covered by this standard, but it is recommended that this term should not be applied to PVC sheeting above 75 μm nominal thickness.

3.2

nominal thickness

the thickness of sheeting in micrometres as stated by the supplier

NOTE When agreed between the purchaser and the supplier the thickness may be expressed in millimetres.

3.3

gravimetric thickness

the value of thickness derived from the mass of a known area of sheeting and its relative density by method 512A of BS 2782:1970, except that it is expressed in micrometres

NOTE When agreed between the purchaser and the supplier the thickness may be expressed in millimetres.

3.4

micrometer thickness

the value of thickness determined by direct measurement using a micrometer gauge by method 512B or BS 2782:1970, except that it is expressed in micrometres. This method is not suitable for embossed sheeting

NOTE When agreed between the purchaser and the supplier the thickness may be expressed in millimetres.

3.5

printed sheeting

sheeting to which a continuous or discontinuous transparent or coloured surface coating has been applied and including all multitone effects and lacquered surfaces

3.6

embossed sheeting

printed or unprinted sheeting having a raised or indented pattern, also known as textured sheeting

NOTE Plain frosted (matt) or polished PVC sheeting, if produced by an operation subsequent to the calendering process is, by convention, included in this definition.

3.7

laminated sheeting

superimposed plies (layers) of single sheeting bonded together by any suitable process

3.8

roll of sheeting

sheeting in roll form, in length not less than 10 m, as supplied by the manufacturer

3.9

sample of sheeting

a sample taken in accordance with clause 5

3.10

sequence of samples

all samples of sheeting tested by the manufacturer or the purchaser, and manufactured to comply with the requirements of this standard, during a period not exceeding six months

4 Composition

All sheeting in accordance with this British Standard shall be manufactured from a polymer of vinyl chloride and/or a copolymer, the major constituent of which shall be vinyl chloride. Such material shall be suitably compounded and converted, by calendering, into sheeting of nominal thickness up to and including 400 µm. Sheeting of types 1B and 2B may be formulated by any suitable means to ensure that specimens of 550 mm × 35 mm when tested by method 508C (as amended in 1974) of BS 2782:1970 shall meet the requirement for distance of travel of flame in Table 2.

5 Sampling

A representative sample which is the full width of the sheeting, not less than 1 m² in area and not less than 1 m in length shall be taken. The longitudinal direction of the sheeting shall be marked on the sample. The information given on the label shall be supplied with the sample. To avoid difficulties in subsequent testing, the sample should be rolled on a tube of adequate diameter.

The sample shall thereafter be kept out of contact with other plastics materials. When sheeting in roll form is being sampled, the sample shall be taken from a position in which no part of it is less than three layers from either end of the roll.

The preferred manner of selecting test pieces from the sample is given in Appendix A.

For visual examination only, either a sample at least 3 m in length by the full width of the sheeting shall be taken, or an equivalent uncut length of the roll shall be examined by the method specified in Appendix B.

If it is desired to carry out the test for determining the number of pin-holes (see Appendix C), arrangements should be made by the manufacturer or the purchaser for a larger representative sample to be supplied.

6 Marking

Sheeting supplied in accordance with this British Standard shall bear a label giving the following information.

- a) Name and/or trade mark of the manufacturer.
- b) The number of this British Standard and the type reference of the sheeting. Where sheeting is laminated and/or embossed this shall also be stated, e.g. BS 1763 type 1B — laminated embossed.
- c) Nominal thickness, width, length and/or net mass of sheeting.

- d) Date of manufacture on sheeting intended for printing.

NOTE It is recommended that further information as to the nature, properties and use of flexible PVC sheeting be made available to users. Means of achieving suitable informative labelling are indicated in Appendix M.

7 Visual examination

Sheeting of all types shall not contain bubbles or blisters and shall be substantially free from creases of a permanent nature, streaks, pin-holes and specks of foreign matter when examined in accordance with the method specified in Appendix B. Embossed sheeting shall have the design uniformly applied.

Sheeting of types 1A and 1B shall be of uniform surface finish. Sheeting of types 2A and 2B shall have the print design uniformly applied. In addition, the print shall be free from smudges, blotches and similar defects. The back of the sheeting shall be free from transferred print when examined in accordance with the method specified in Appendix B.

NOTE 1 It is recommended that a sample at least 1 m² in area and similar to that which is to be supplied should be deposited with the purchaser as an agreed standard for the purpose of assessing compliance with this clause.

NOTE 2 Laminated material for inflatable goods, drum liners or similar applications is not covered by this clause as this standard is for general purpose sheeting. A test method for determining the number of pin-holes is given in Appendix C and its use, together with a limit, should be agreed between the purchaser and the supplier for such special purpose materials.

8 Requirements for physical properties

When tested in accordance with the methods specified in Table 1 and Table 2, the sheeting shall comply with the limiting values indicated, subject to the statistical control provisions of clause 9. If resistance to sulphur staining is required, sheeting shall be tested in accordance with Appendix D and the permissible change in colour of the test pieces shall be as specified in Table 2.

NOTE For routine testing of the sheeting for compliance with this British Standard, the properties given in Table 1, which are dependent on both the manufacturing processes and the basic formulation of the sheeting, should be determined more frequently than those in Table 2. It should not be inferred that all the properties in Table 1 need to be determined on each sample. The properties in Table 2 need to be determined less frequently, as the results are dependent essentially on the basic formulation of the sheeting. For example, in a sequence of batches the frequency of testing the properties in Table 2 may be reduced to the level of one sample to every 15 samples on which the properties in Table 1 are determined.