
International Standard



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Polymeric materials, cellular flexible — Polyvinylchloride foam sheeting — Specification

Matériaux polymères alvéolaires souples — Feuilles de mousse de polychlorure de vinyle — Spécifications

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Descriptors: plastics, polymers, polyvinyl chloride, flexible cellular materials, sheets, specifications, tests, marking.

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6453 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Polymeric materials, cellular flexible — Polyvinylchloride foam sheeting — Specification

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0 Introduction

Flexible cellular polyvinylchloride (PVC) sheeting is available in two types as follows:

- type 1 — open cell material;
- type 2 — closed cell material.

The sheeting is graded according to hardness index, measured in accordance with ISO 2439. For type 1 sheeting, a single hardness level is specified, but for type 2 sheeting, a range is specified. For sheeting which is available in any thickness up to approximately 100 mm, the material indentation hardness index is specified. For type 2 material, which is normally available only in thicknesses much less than 50 mm, it is necessary to use a test piece consisting of a number of plies, and the product indentation hardness index is therefore specified.

Attention is drawn to the commercial availability of sheeting complying with the requirements of this International Standard and claimed to have flame retardant characteristics. Specific requirements for this type of sheeting cannot be included in this International Standard because no generally accepted method of test for flammability is available, although ISO 3795 (FMVSS 302) is commonly used in the motor industry. Efforts to devise such a method are being made at both the national and international levels. Sheeting with flame-retardant characteristics is normally coloured pink or printed with appropriate identification.

Further requirements on fogging and sound absorbance, and improvements in the method for assessing low-temperature characteristics, are under consideration.

1 Scope and field of application

This International Standard specifies requirements for flexible cellular PVC in the form of sheets up to 100 mm in thickness for use in applications involving dielectric (HF) welding (for example padding and quilting).

Two types of sheeting are specified as follows:

- type 1 — open cell material;
- type 2 — closed cell material.

2 References

- ISO 105, *Textiles — Tests for colour fastness*
Section A03, *Grey scale for assessing staining*.
Section B01, *Colour fastness to light: Daylight*.
- ISO 845, *Cellular rubbers and plastics — Determination of apparent density*.
- ISO 1798, *Flexible cellular materials — Determination of tensile strength and elongation at break*.
- ISO 1856, *Polymeric materials, cellular flexible — Determination of compression set*.
- ISO 1923, *Cellular plastics and rubbers — Determination of linear dimensions*.
- ISO 2439, *Polymeric materials, cellular flexible — Determination of hardness (indentation technique)*.

ISO 2440, *Flexible cellular materials — Accelerated ageing tests.*

ISO 3795, *Road vehicles — Determination of burning behaviour of interior materials for motor vehicles.*

3 Sampling, conditioning and measurement

3.1 Sampling

Take representative samples of the flexible cellular PVC sheeting selected at random, the number and size of the sample being agreed between the purchaser and the supplier. The preferred number of samples is three.

3.2 Sample preparation

Remove any backing as carefully as possible to avoid damage to the cellular material. The use of tetrahydrofuran, butanone (MEK) or acetone as a stripping aid is permissible. If these solvents are used, minimal quantities shall be employed and the conditioning period (see 3.3) shall be extended to 24 h.

3.3 Conditioning

Samples shall be tested not less than 16 h after manufacture. They shall be conditioned immediately before testing for a period of not less than 16 h in one of the following standard atmospheres:

- a) 23 ± 2 °C, 50 ± 5 % relative humidity for temperate climates; or
- b) 27 ± 2 °C, 65 ± 5 % relative humidity for tropical climates.

3.4 Test temperature

Unless otherwise specified, tests shall be carried out at a temperature of 23 ± 2 °C or 27 ± 2 °C.

4 Air oven ageing test

4.1 General

This test measures the change in indentation hardness produced on ageing in a ventilated oven.

4.2 Apparatus

A ventilated oven with forced air circulation, of sufficient size to allow free circulation of air with the test piece in position, and capable of maintaining the test piece at a temperature of 100 ± 2 °C, is required.

4.3 Procedure

Determine the appropriate (material or product) indentation hardness index of the test piece as described in ISO 2439, procedure A. Place the test piece in the air oven at a temperature of 100 ± 2 °C for 22 to 24 h. At the end of this period, remove the test piece and allow it to stand for 22 to 24 h at room temperature. Remeasure the appropriate indentation hardness index as described in ISO 2439, procedure A.

4.4 Expression of results

The change in indentation hardness as a result of ageing, C , expressed as a percentage of the original value, is given by the formula

$$\frac{L_f - L_o}{L_o} \times 100$$

where

L_o is the original indentation hardness index;

L_f is the indentation hardness index after ageing.

NOTES

- 1 In cases of dispute, test pieces of different composition should be aged individually.
- 2 Normally the result will be negative.

5 Low-temperature resistance test

5.1 Apparatus

5.1.1 **Flexing apparatus**, as shown in the figure.

5.1.2 **Cold box**, capable of being maintained at temperatures of -5 ± 2 °C, -10 ± 2 °C, -25 ± 2 °C, -40 ± 2 °C, and large enough to permit the bending of the test piece while it is still in the box. The door should be at the top.

5.2 Test piece

The test piece shall consist of a strip about 50 mm wide and 120 mm long, having a thickness of $3 \pm 0,25$ mm, made from sheeting of the same composition as the sheeting under test.

Test pieces of thick material shall be reduced by cutting.

5.3 Procedure

Place the test piece under the mandrel and clamp of the flexing device, one end being left free. Suspend the apparatus in the cold box at a temperature chosen from one of the ranges -5 ± 2 °C, -10 ± 2 °C, -25 ± 2 °C, -40 ± 2 °C, for a period of 2 to 3 h. At the end of this period open the cold box and close the flexing apparatus as quickly as possible, taking no more than 1 s, so that the test piece is bent through 180°. Report any cracks in the test piece.

6 Type 1 sheeting properties

6.1 Structure

The material shall consist substantially of a network of open cells, but may have a small proportion of closed cells. The material shall be of substantially uniform structure and free from defects likely to affect serviceability. Surface skin shall normally be removed but, if required, it may be left on.

NOTE — Type 1 sheeting normally has less than 6 % closed cells.

6.2 Colour

The colour shall be as agreed between the purchaser and the supplier.

6.3 Dimensions

The dimensions shall be as agreed between the purchaser and the supplier subject to the following tolerances:

- a) length and width — 0, +2 % of the specified nominal values;
- b) thickness — 0, +0,6 mm or 10 % of the specified nominal value, whichever is the greater.

Dimensions shall be determined in accordance with ISO 1923, after preparation as described in clause 3.

6.4 Physical properties

The material shall comply with the requirements specified in table 1. All tests shall be carried out on material samples and under conditions as specified in clause 3.

6.5 Marking

Each roll or lot of type 1 sheeting shall have attached to it, or to its immediate packing, a label bearing the following

information, unless otherwise agreed between the supplier and the purchaser:

- a) the name and/or distinctive mark of the manufacturer;
- b) the batch number or other reference to identify the material with a manufacturing batch;
- c) the nominal thickness;
- d) the nominal width;
- e) the nominal length;
- f) the number of this International Standard with the type and grade of sheeting as suffix, for example ISO 6453/1/210.

7 Type 2 sheeting properties

7.1 Structure

The material, usually produced on a backing or a carrier, shall consist substantially of a network of closed cells, but may have a small proportion of open cells. The material shall be of substantially uniform structure and free from defects likely to affect serviceability. Any surface skin shall not adversely affect the performance characteristics.

7.2 Colour

The colour shall be as agreed between the purchaser and the supplier.

7.3 Dimensions

The dimensions shall be as agreed between the purchaser and the supplier subject to the following tolerances:

- a) length and width — 0, +2 % of the specified nominal values;
- b) thickness — 0, +0,6 mm or 10 % of the specified nominal value, whichever is the greater.

Dimensions shall be determined in accordance with ISO 1923 after preparation as described in clause 3.

Table 1 — Physical requirements for type 1 sheeting

Property	Requirement or limit	Method of test
Material indentation hardness index	210 ± 40 N	ISO 2439, procedure A
Air oven ageing: change in material indentation hardness index, max.	± 20 %	Clause 4 and ISO 2440
Compression set, max.	20 %	ISO 1856, method B, except test piece 12 mm thick using 50 % compression
Density	Agreed value ± 15 %	ISO 845
Tensile strength, min.	100 kPa	ISO 1798
Elongation at break, min.	80 %	ISO 1798
Low-temperature resistance	No cracks	Clause 5
Organic materials staining ¹⁾	Shall not stain	Annex

1) By agreement between purchaser and supplier the requirement for non-staining may be deleted.

7.4 Hardness

Sheeting shall be supplied in the grades of hardness as specified in table 2 when tested by the method described in ISO 2439, procedure A, except that preloading shall be to $50 \pm 2,5$ % of the thickness.

Table 2 – Hardness grades of type 2 sheeting

Grade	280	340	400
Product indentation hardness index N	280 ± 30	340 ± 30	400 ± 30

NOTE — Hardness measured using a 50 ± 2 mm test piece consisting of a number of plies.

7.5 Physical properties

The material shall comply with the requirements specified in table 3. All tests shall be carried out on material sampled and conditioned as described in clause 3.

7.6 Marking

Each roll or lot of type 2 sheeting shall have attached to it, or to its immediate packing, a label bearing the following information, unless otherwise agreed between the supplier and the purchaser :

- a) the name and/or distinctive mark of the manufacturer ;
- b) the batch number or other reference to identify the material with a manufacturing batch ;
- c) the nominal thickness ;
- d) the nominal width ;
- e) the nominal length ;
- f) the number of this International Standard with the type and grade of sheeting as suffix, for example ISO 6453/2/340.

Table 3 – Physical requirements for type 2 sheeting

Property	Requirement or limit	Method of test
Air oven ageing : change in product indentation hardness index, max.	± 25 %	Clause 4 and ISO 2440
Compression set, max.	25 %	ISO 1856, method B, except test piece 12 mm thick using 50 % compression
Density	Agreed value ± 15 %	ISO 845
Tensile strength, min.	150 kPa	ISO 1798
Elongation at break, min.	80 %	ISO 1798
Low-temperature resistance	No cracks	Clause 5
Organic materials staining ¹⁾	Shall not stain	Annex

1) By agreement between purchaser and supplier the requirement for non-staining may be deleted.

Dimensions in millimetres

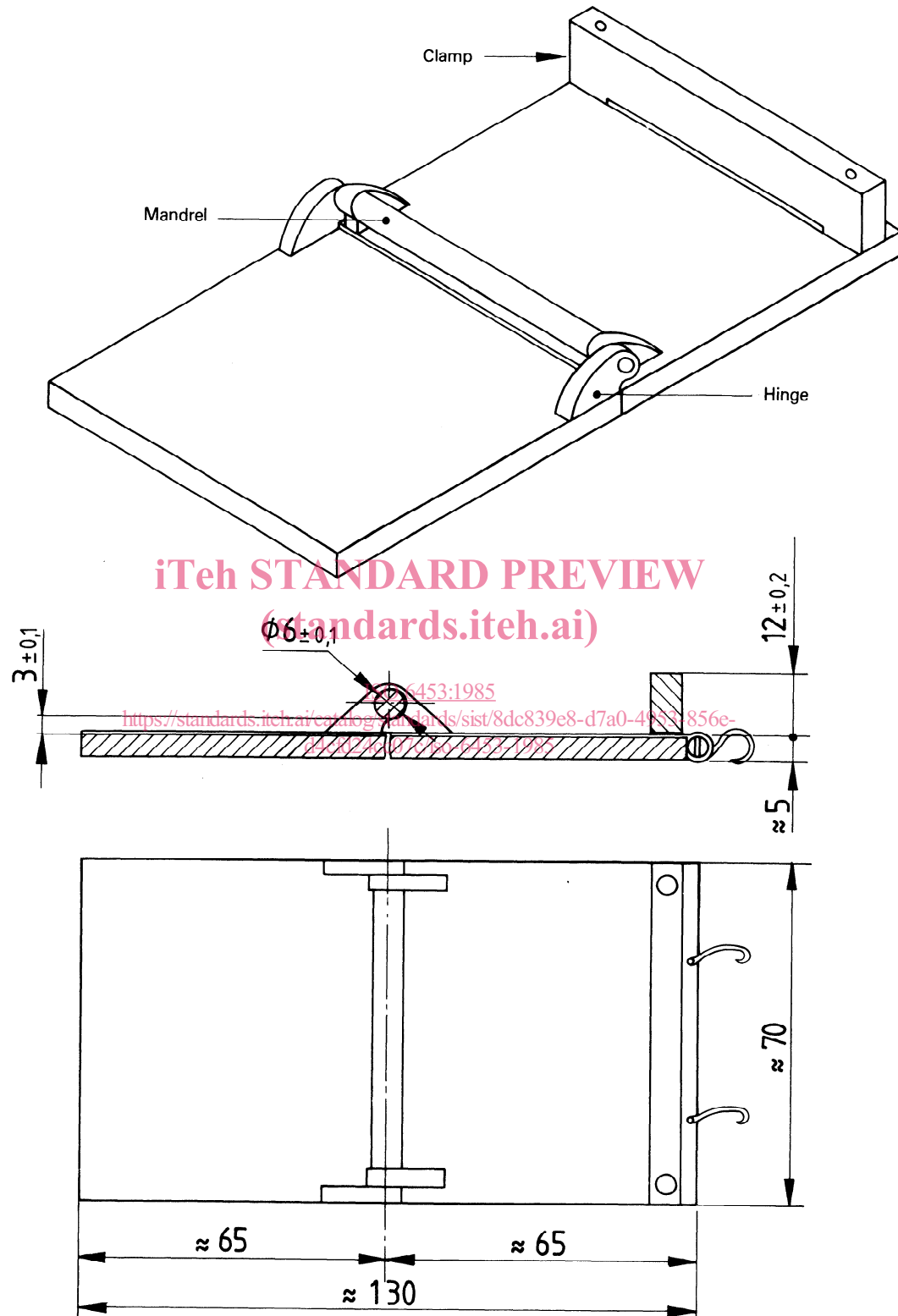


Figure — Low-temperature flexing apparatus

Annex

Organic materials staining

(This annex forms an integral part of the standard.)

A.1 General

This test is intended to provide information as to whether the material will cause discoloration of plastics material (or organic finishes) with which it will be in contact.

A.2 Test and reference panels

The test and reference panels shall consist of suitably dimensioned pieces of any organic finished material which may present a visibly significant surface in use, and which may be affected, directly or indirectly, by the flexible PVC sheeting in service.

Unless agreed to the contrary between the purchaser and the supplier, the test panels shall consist of supported or unsupported light-coloured sheeting (cream or white, as specified by the purchaser).

A.3 Procedure

Ensure that the surfaces of the test piece of PVC sheeting are free from loosely adhering matter by brushing with a clean soft brush. Hold the test piece in contact with the test panel under a pressure of approximately 15 ± 2 kPa. Then subject the test assembly and a reference panel to a temperature of 70 ± 2 °C in an air oven for a period of 24 h. After cooling, for 3 ± 1 h at the standard temperature of test given in 3.4, and removal of the test piece, expose the test and reference panels to an artificial source of ultraviolet light for a period sufficient for the coloured reference standard 3 of ISO 105-B01 to fade to contrast 3 on the grey scale specified in ISO 105-A03.

Compare the two panels and report as staining any difference between the test panel and the reference panel.

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