INTERNATIONAL STANDARD

ISO 2896

Third edition
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Rigid cellular plastics — Determination of water absorption

Plastiques alvéolaires rigides — Détermination de l'absorption d'eau

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 2896 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 10, *Cellular plastics*.

This third edition cancels and replaces the second edition (ISO 2896:1987), which has been technically revised.

Annex A forms a normative part of this International Standard.

Rigid cellular plastics — Determination of water absorption

1 Scope

This International Standard specifies a method for the determination of the water absorption of rigid cellular plastics by measuring the buoyant force on a test specimen after immersion under a 50 mm head of water for 4 days. Corrections are specified to take account of any change in volume of the specimen and also to correct for the volume of water in the cut surface cells of the specimen. The water absorption is expressed as the average, for several specimens, of the percentage increase in volume relative to the original volume.

The method described is intended for quality control and for use in product specifications.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 291:1997, *Plastics — Standard atmospheres for conditioning and testing*

ISO 1923:1981, *Cellular plastics and rubbers — Determination of linear dimensions*

3 Principle

The water absorption of a material is determined by measurement of the buoyant force on a specimen immersed in distilled water for a specified time.

4 Materials

4.1 Distilled water, de-aerated (by storage for at least 48 h after distillation), for use as the immersion liquid.

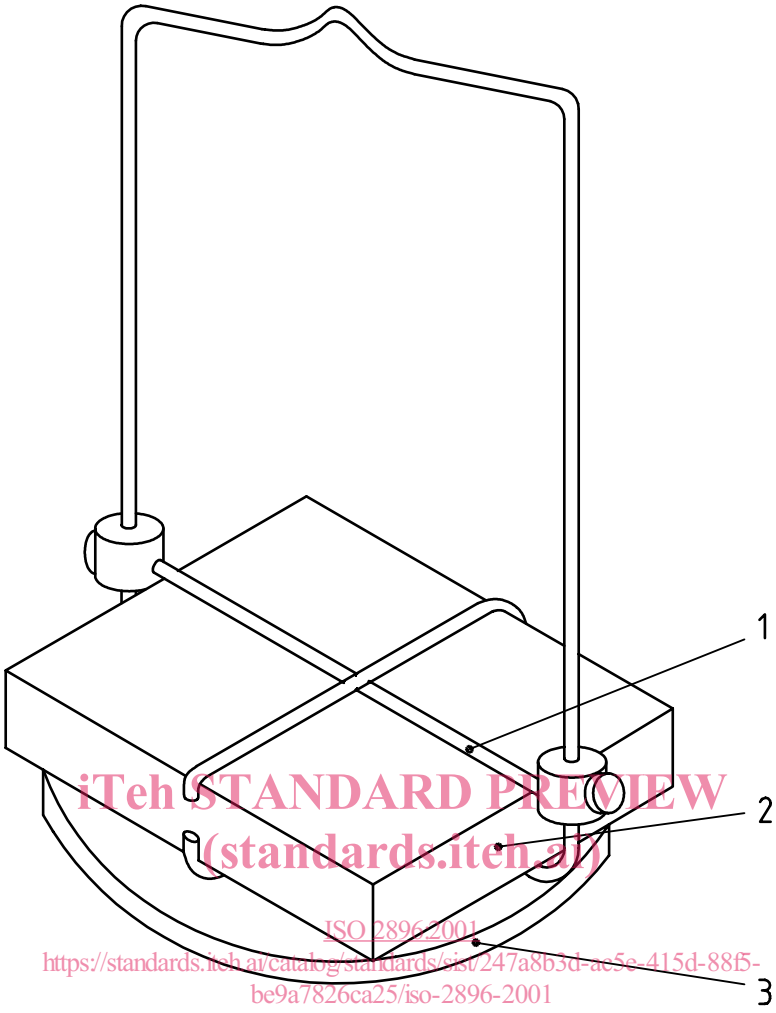
5 Apparatus

5.1 Balance, accurate to 0,1 g and capable of suspending the cage (5.2).

5.2 Underwater-weighing cage, made of a stainless material not attacked by distilled water and large enough to contain a test specimen. A sinker heavy enough to compensate for the upthrust produced by the test specimen shall be attached to the base of the cage. The cage shall be fitted with a means of suspending it from the balance. See Figure 1 for an example.

5.3 Cylindrical vessel, at least 250 mm in diameter and 250 mm in height.

5.4 Low-permeability plastic film, for example polyethylene.



Key

1 Mesh cage

2 Specimen

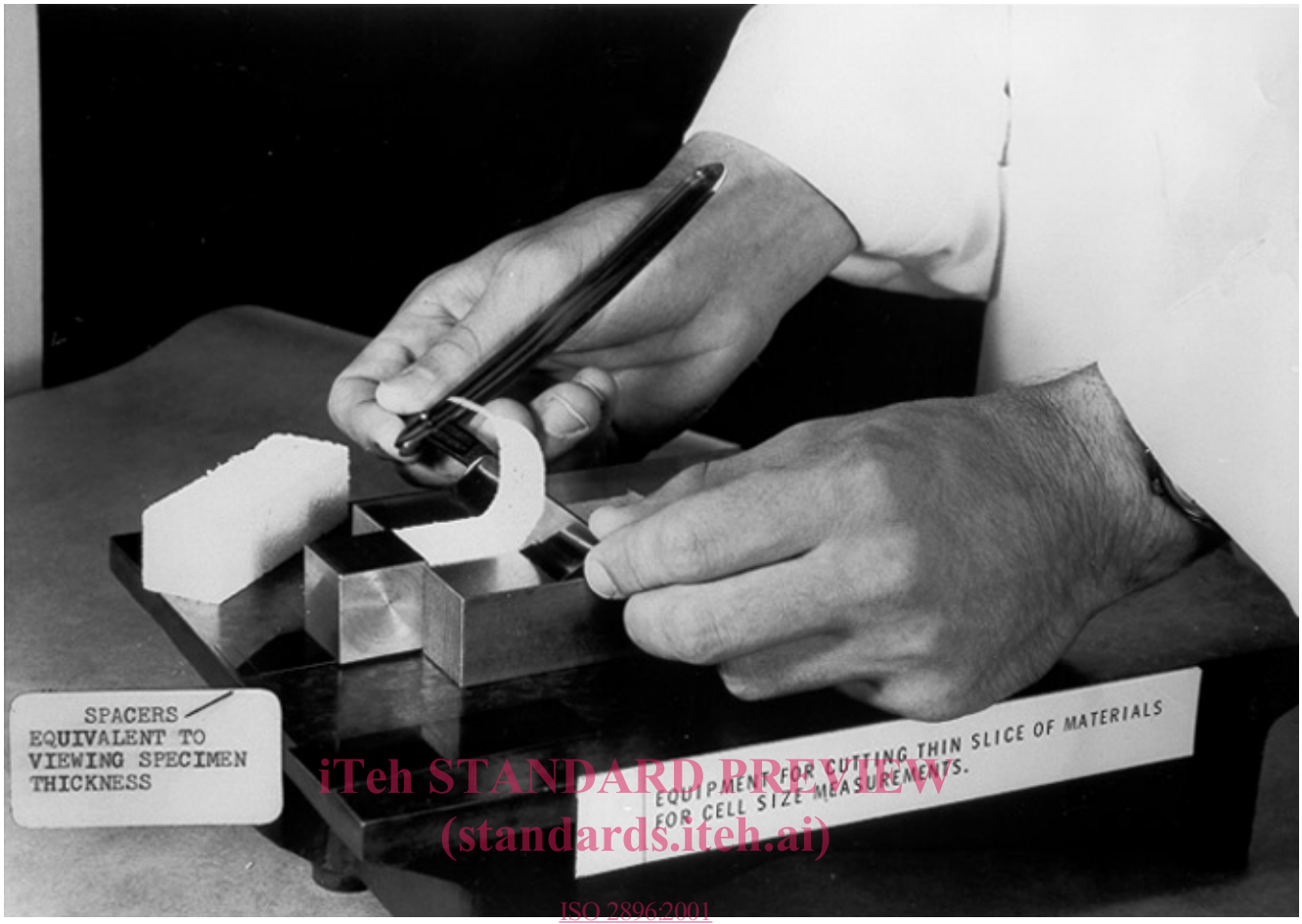
3 Sinker

Figure 1 — Test specimen in mesh underwater-weighing cage

5.5 Slicer: cutting-blade apparatus capable of preparing thin specimens (0,1 mm to 0,4 mm thick) for cell size viewing. Figure 2 shows an acceptable apparatus.

5.6 Slide assembly, consisting of two pieces of slide glass hinged by tape along one edge, between which is placed a calibrated scale (3 cm in length) printed on a thin plastic sheet (see Figure 3).

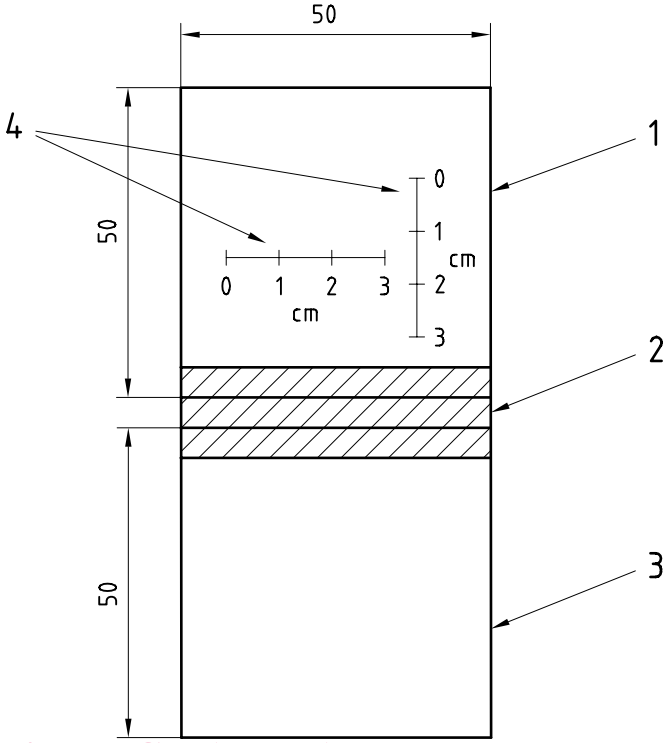
5.7 Projector: conventional 35 mm slide projector that accepts standard 50 mm × 50 mm slides, or a projection microscope with a calibrated scale.



NOTE The spacer thickness is chosen to give the required viewing-specimen thickness.

Figure 2 — Razor-blade equipment for slicing cellular plastics for determination of average cell diameter

Dimensions in millimetres



Key

1 Calibrated glass slide
2 Flexible tape hinge
3 Blank cover glass
4 Cell-count scales

Figure 3 — Slide assembly

6 Specimens

6.1 Number of specimens

At least three specimens shall be tested.

6.2 Dimensions

Specimens shall be at least 500 cm^3 in volume, with a nominal length of 150 mm and a nominal width of 150 mm. For materials produced and sold with natural or laminated skin surfaces, the thickness shall be as produced. For materials produced with a thickness greater than 75 mm and without skin surfaces, the material shall be trimmed to 75 mm in thickness for testing. The distance between two faces shall not vary by more than 1 % (tolerance of parallelism).

6.3 Preparation and conditioning

Surfaces of specimens shall be smooth and free from dust. Dry the specimens in a desiccator at ambient temperature until the results of two successive weighings, at intervals of at least 12 h, do not differ by more than 1 % of their mean.

7 Procedure

7.1 Operate in a room where the temperature is maintained in accordance with ISO 291. Unless otherwise specified[1)], conditions shall be (23 ± 2) °C and (50 ± 5) % relative humidity.

7.2 Weigh a specimen to the nearest 0,1 g (mass m_1).

7.3 Measure the dimensions of the specimen in accordance with ISO 1923 for the calculation of V_0.

7.4 Fill the cylindrical vessel (5.3) with de-aerated distilled water (4.1) at ambient temperature.

7.5 Immerse the assembled cage (5.2), remove any bubbles, attach it to the balance and determine the apparent mass (m_2) to the nearest 0,1 g.

7.6 Place the specimen in the cage. Re-immerse the cage so that the distance between the surface of the water and the top surface of the specimen is approximately 50 mm. Remove obvious air bubbles from the specimen with a brush or by agitation.

7.7 Cover the cylindrical vessel with low-permeability plastic film (5.4).

7.8 After (96 ± 1) h, or another agreed immersion period, remove the plastic film and determine the apparent mass (m_3), to the nearest 0,1 g, of the submerged cage containing the specimen.

7.9 Visually examine the specimen for evidence of swelling. To determine corrections for swelling and cut surfaces, follow procedure A (8.1) for uniform swelling and procedure B (8.2) for non-uniform swelling.

7.10 Carry out the above procedure for each specimen individually.

8 Corrections for swelling and cut surfaces

8.1 Procedure A (uniform swelling)

8.1.1 Applicability

Use procedure A when there is no evidence of non-uniform deformation of the specimen.

8.1.2 Correction for uniform swelling

Remove the specimen from the water and re-measure its dimensions within 4 h of removal. The correction for uniform swelling of the specimen S_0 is

$$S_0 = \frac{V_1 - V_0}{V_0}$$

where

V_0 is the original volume, in cubic centimetres, of the specimen (see 9.1);

1) For tropical countries, test conditions will normally be (27 ± 2) °C and (65 ± 5) % relative humidity.