INTERNATIONAL STANDARD

ISO 4586-2

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AMENDMENT 4
2000-04-01

High-pressure decorative laminates — Sheets made from thermosetting resins —

Part 2: Determination of properties

AMENDMENT 4: Resistance to surface wear

Stratifiés décoratifs haute pression — Plaques à base de résines thermodurcissables —

Partie 2: Détermination des caractéristiques

AMENDEMENT 4: Résistance de la surface à l'abrasion

Reference number
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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 amendment may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

Amendment 4 to International Standard ISO 4586-2:1997 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

High-pressure decorative laminates — Sheets made from thermosetting resins —

Part 2:
Determination of properties

AMENDMENT 4: Resistance to surface wear

This clause replaces clause 6 of ISO 4586-2:1997.

6 Resistance to surface wear

6.1 Principle

The test measures the ability of the decorative surface of the sheet under test to resist abrasive wear-through to the sub-layer. Abrasion is achieved by rotating a specimen in contact with a pair of loaded cylindrical wheels covered with abrasive paper. The wheels are positioned so that their cylindrical faces are equidistant from the specimen's axis of rotation but not tangential to it. As they are turned by the rotating specimen, they abrade an annular track on the specimen's surface. The numbers of revolutions of the specimen required to cause defined degrees of abrasion are used as measures of resistance to surface wear.

6.2 Materials

6.2.1 Calibration plates of rolled zinc sheet (Taber S-34 or equivalent), having a thickness of 0,8 mm ± 0,1 mm and a Brinell hardness of 48 ± 2 when tested in accordance with ISO 6506, except that the ball diameter shall be 5 mm and the load 360 N.

6.2.2 Abrasive paper strips (Taber S-42 or equivalent), of width 12,7 mm ± 0,1 mm and length about 160 mm, having the following composition:

a) paper of grammage 70 g/m^2 to 100 g/m^2;

b) open coated 180 grit powdered aluminium oxide (Al_2O_3) having a particle size such that it will pass through a sieve of aperture 100 μm and remain on a sieve having an aperture of 63 μm;

c) adhesive backing (optional).

6.2.3 Double-sided adhesive tape, required only if the abrasive paper has no adhesive backing.

6.3 Apparatus

6.3.1 Test machine, as specified in ISO 9352.

NOTE A suitable machine is available from Taber Acquisition Corp., Taber Industries, 455 Bryant St, P.O. Box 164, North Tonawanda, NY 14120, USA.

6.3.2 Conditioning chamber, with a standard atmosphere of 23 °C ± 2 °C, relative humidity of (50 ± 5) %.

6.4 Test specimens

Each specimen shall be a piece of the sheet under test, shaped to fit the type of clamping device used. It will usually be a disc of diameter about 130 mm, or a square of side about 120 mm with its corners rounded to give a diagonal of about 130 mm, and it will usually have a hole of diameter 6 mm in its centre. Three specimens shall be prepared.

6.5 Preparation of specimens and abrasive paper

Clean the surface of the specimens with a non-hazardous organic solvent which is immiscible with water. Using a suitable marker pen, mark the surface of each specimen with two lines at right angles to each other so that the surface area is divided into quadrants. Precondition the specimens and the abrasive strips for at least 72 h in the conditioning atmosphere (see 6.3.2) before testing. After preconditioning, seal the paper strips in suitable polyethylene bags (maximum 10 strips per bag) until required for immediate use.

6.6 Procedure

6.6.1 Preparation of abrasive wheels

Bond a strip of preconditioned unused abrasive paper (6.2.2) to each of the rubber-covered wheels, using either the adhesive backing, if present, or the double-sided adhesive tape (6.2.3), in such a way that the cylindrical surface is completely covered, but without any overlapping of the abrasive paper.

6.6.2 Calibration of abrasive paper

Prepare two abrasive wheels with preconditioned unused strips of abrasive paper from the batch to be used for testing (see 6.6.1).

Clamp a zinc plate (6.2.1) in the specimen holder, start the suction device, set the revolution-counter to zero, lower the wheels and abrade the zinc plate for 500 revolutions. Wipe the zinc plate clean and weigh to the nearest 1 mg. Replace the abrasive paper on the wheels with preconditioned unused strips from the same batch, clamp the same zinc plate in the specimen holder, lower the abrasive wheels and operate the suction device. Abrade the zinc plate for an additional 500 revolutions, then wipe it clean and reweigh it to the nearest 1 mg. Its loss in mass shall be 130 mg ± 20 mg.

Any batch of abrasive paper which causes a loss in mass of the zinc plate outside this permitted range shall not be used for testing.

6.6.3 Abrasion of specimen

Perform the test immediately after removal of the specimen and calibrated abrasive paper from the preconditioning atmosphere.

Prepare two wheels with preconditioned unused abrasive paper from the same batch previously approved by calibration. Fit the wheels to the machine and set the revolution counter to zero.

Clamp the specimen in the holder, ensuring that its surface is flat. Lower the abrasive wheels on to the specimen, start the suction device and begin abrading the specimen. Examine the specimen for wear after each 25 revolutions and examine the abrasive paper for clogging with abraded particles. Replace the abrasive paper if it becomes clogged, or after 500 revolutions, whichever happens first.

Continue the test in this way until the initial wear point (IP) is reached. Record the number of revolutions and resume the test until the final wear point (FP) is reached. Record the number of revolutions again.

The initial wear point (IP) is the point at which the first clearly recognizable wear-through of the print, pattern, plain colour coating or solid paper appears and the sub-layer becomes exposed in three quadrants, with areas of at least 0,6 mm^2 wear-though in each of the three quadrants. The sub-layer for printed patterns is the background on which the pattern is printed; for plain colours it is the first sub-layer of different colour [1) 2)].

The final wear point (FP) occurs in the case of a patterned laminate when about 95 % of the pattern is removed in the abraded area, and in the case of a plain-colour laminate when an underlayer of a different colour is exposed over about 95 % of the abraded area.

6.7 Expression of results

Calculate the wear resistance, expressed as a number of revolutions, for each specimen using the following equation:

$$\text{Wear resistance} = \frac{IP + FP}{2}$$

where

IP is the initial wear point, expressed as a number of revolutions;

FP is the final wear point, expressed as a number of revolutions.

Average the value of the initial wear point (IP) of three specimens tested.

Average the value of the wear resistance of three specimens tested, rounded to the nearest 50 revolutions.

6.8 Test report

The test report shall include the following information:

a) a reference to this part of ISO 4586;

b) the name and type of product;

c) the average initial wear point (IP) of the sample under test, in revolutions;

d) the average surface wear resistance of the sample under test, in revolutions;

e) any deviation from the specified procedure;

f) the date of the test.

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1) A full-colour photographic visual aid, known as the IP poster, is available to assist correct interpretation, and increase repeatability and reproducibility in the determination of the initial wear point (IP). The poster is available from SIS Förlag AB, Box 6455, SE-113 82 Stockholm, Sweden; Tel. +46 8 610 30 60, Fax. +46 8 30 18 50 (order reference 21824 IP poster).

2) Also available is a dirt size estimation chart. The use of this chart is recommended to determine precisely the size, in square millimetres, of the wear-through area. It is available from TAPPI, Technology Park/Atlanta, P.O. Box 105113, Atlanta, GA 30348-5113, USA; Tel. +1 770 446 1400, Fax. +1 770 446 6947 (order reference TAPPI — Dirt size estimation chart).