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Laminate floor coverings — Determination of abrasion resistance

Revêtements de sol stratifiés — Détermination de la résistance à l'abrasion

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 219, *Floor Coverings*.

This third edition cancels and replaces the second edition (ISO 24338:2014), which has been technically revised.

The main changes are as follows:

— In Clause 4, 3 samples to be taken from 3 different flooring elements instead of only one panel;

— In Clause 5, the evaluation of abrasion is now in octants instead of quadrants.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/member.html.

Laminate floor coverings — Determination of abrasion resistance

1 Scope

This document specifies two methods (A and B) for measuring abrasion of laminate floor covering elements. The tests described measure the ability of the surface layer to resist abrasive wear-through.

Abrasion according to method A is achieved by rotating a test specimen in contact with a pair of loaded cylindrical wheels covered with specified abrasive paper. The resistance to wear according to method B is evaluated by abrading the face of test pieces with a specified abrasive applied by means of two loaded wheels. The number of revolutions of the test specimen required to cause a defined degree of abrasion is measured by both methods.

NOTE The precision of the methods is not known. When inter-laboratory data become available, a precision statement will be added.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 48, *Rubber, vulcanized or thermoplastic —Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 868:2003, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)*

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 7267-2, *Rubber-covered rollers — Determination of apparent hardness — Part 2: Shore-type durometer method*

ASTM D785, *Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials*

FEPA standard 42-D, *Grains of fused aluminium oxide, silicon carbide and other abrasive materials for bonded abrasives and for general industrial applications*

FEPA standard 44-D, *Grains of fused aluminium oxide, silicon carbide and other abrasive materials. Determination of bulk density*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp.

— IEC Electropedia: available at https://www.electropedia.org/.

4 Apparatus

4.1 Testing machine (for method A and B) (see Figure 1)

4.1.1 Test specimen holder (for method A and B)

Disc-shaped holder with a diameter of approximately 105 mm (item 7 in Figure 1), which rotates in a horizontal plane with a permitted deviation of ±2 mm/m at a frequency of (60 ± 2) rotations per minute and to which the test specimen (item 6 in Figure 1) can be clamped with a clamping screw (item 5).

4.1.2 Holding and lifting device (for method A and B)

Holding and lifting device for the abrasive wheels, so constructed that each wheel exerts a force of (5,4 ± 0,2) N (Method A) or (10 ± 0,2) N (Method B) on the test specimen.

For Method B a counterweight of (150 ± 3) g is required to counterbalance the mass of the leather abrading wheel (see 4.2.3). A second pair of leather abrading wheels may be used for this purpose.

The calibration and maintenance of the Taber® abraser arms shall be carried out according to Annex A.

4.1.3 Rubber covered abrasive wheels (for method A)

Two cylindrical rubber-covered wheels of (12,7 ± 0,1) mm width and 50 mm diameter, which rotate freely about an axis (item 3 in Figure 1). The curved surface of the wheels, to a depth of 6 mm, shall be made of rubber (item 2) with a hardness of (65 ± 3) IRHD (according to ISO 48) or (65 ± 3) Shore A (according to ISO 7267-2). A description of the measurement and of a suitable measurement setup is shown in Annex B.

The inside faces of the wheels shall be (52,5 ± 0,2) mm apart and equally spaced [(26,25 ± 0,10) mm] from the centre line of the abrader head and the axis of the wheels shall be (19,05 ± 0,3) mm from the vertical axis of the test specimen holder.

It is important to ensure that the abrasive wheels are in good condition, as variations in flatness, hardness, regularity, roundness and width can significantly affect the test result.

It is important that the dimensions and tolerances in 4.1.3 and in Figure 1 are met as deviations can lead to errors exceeding 100 %. See Annex B for more information.

4.1.4 Abrasive paper strips (for method A)

Abrasive strips[1)] of (12,7 ± 0,1) mm wide in the machine direction and approximately 160 mm long shall be used (item 1 in Figure 1). They shall meet the following requirements:

— weight: 70 g/m^2 to 100 g/m^2;

— open coated 180 grit aluminium oxide (Al_2O_3), with a particle size that will pass through a 100 µm aperture sieve and remain on a 63 µm aperture sieve;

— glue bonded;

— adhesive backing.

1) The abrasive paper strips Taber® S-42 is the trade name of a product supplied by Taber® Industries. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

4.1.5 Calibration plates (for method A)

Rolled zinc sheet[2)], with a thickness of (0,8 ± 0,1) mm and a Brinell hardness of (48 ± 2) (according to ISO 6506-1, with a ball diameter of 5 mm and a load of 360 N), shall be used. For type approval or verification purposes, the zinc plate shall not be used for more than 10 calibrations per side.

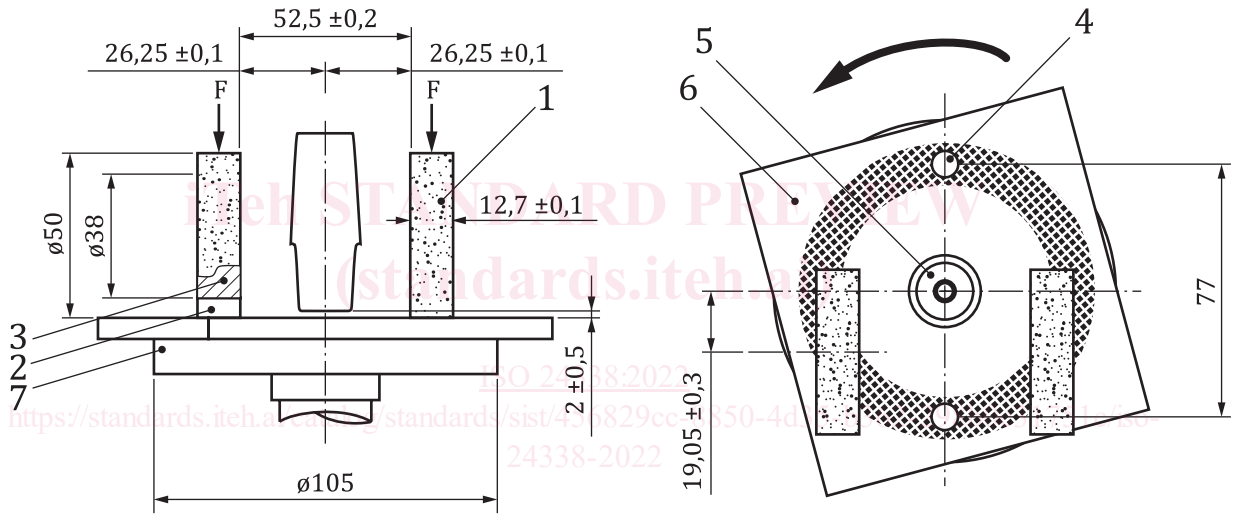
4.1.6 Suction device (for method A)

Two suction nozzles (item 4 in Figure 1) shall be so fitted that they cover the abraded area of the test specimen. One nozzle shall be situated between the wheels, the other diametrically opposite. The centres of the nozzles shall be 77 mm apart and (2 ± 0,5) mm from the surface of the test specimen. When the nozzles are closed, there shall be a vacuum of (1,5 to 1,6) kPa.

4.1.7 Revolution-counter (for method A and B)

A revolution counter is used to record the number of revolutions of the specimen holder.

Dimensions in millimetres



a) Side view **b) Top view**

Key

1 abrasive paper
2 rubber
3 abrasive wheel
4 suction nozzle
5 clamping screw
6 specimen
7 specimen holder disc

Figure 1 — Abrasion resistance testing machine

4.2 Grit feeder and accessories (only for method B)

4.2.1 General

A grit feeder shall have a minimum storage capacity of about 200 g of grit and it shall be possible to open the feeder at its top and at its bottom. The bottom opening shall be positioned (10 ± 1) mm above the face of the test piece and have a length of (16 ± 1) mm and width of (3,18 ± 0,38 mm). The length of

2) Taber® S-34 is the trade name of a product supplied by Taber® Industries. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

the bottom opening shall be installed radially to the test specimen holder. A device in the grit feeder shall ensure a regular flow. The feeder shall also be equipped with a device that ensures an immediate stop of the feeding when required (see Figure 2 and Figure 3).

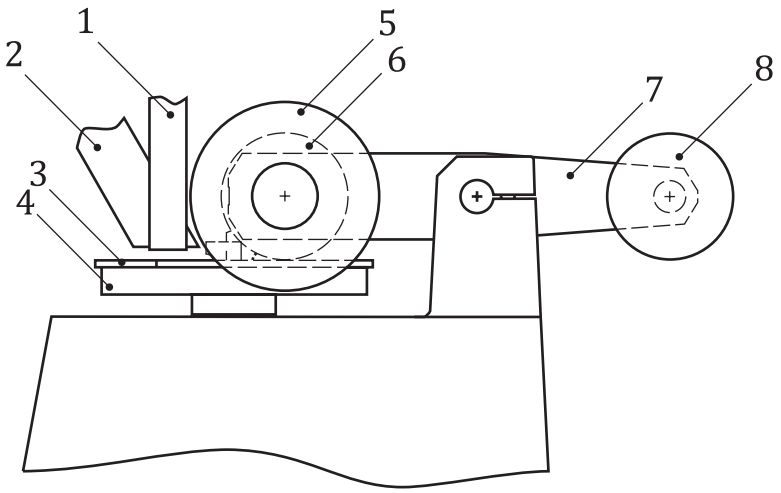
4.2.2 Vacuum cleaning device

A suction nozzle, positioned (3 ± 2) mm above the track to be abraded, shall be installed in the axial vertical plane on the left wheel after the abrasive grit passes under the wheel (relative to the rotation direction, see Figure 3). The vacuum power shall be set at a level that removes all dust and debris.

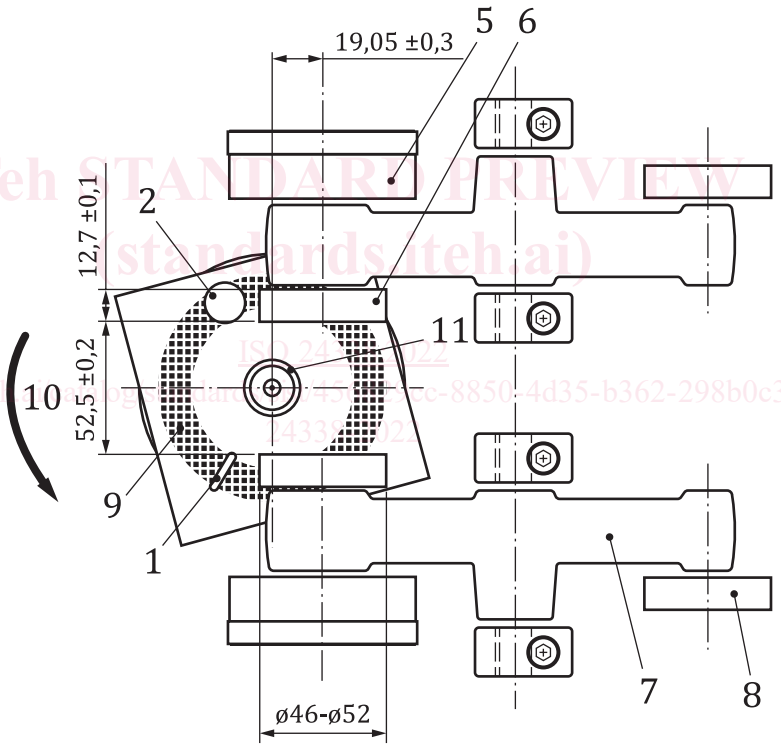
Figure 2 — Example of a Taber® Abraser with Grit Feeder[3)]

3) Taber® Abraser with Grit Feeder is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

Dimensions in millimetres



a) Side view



b) Top view

Key

1 grit nozzle
2 suction nozzle
3 test piece
4 specimen holder
5 testing weight
6 abrading wheel
7 abrader arm
8 counterweight
9 wearing surface
10 direction of rotations
11 clamping nut

Figure 3 — Drawing of an abraser with grit feeder

4.2.3 Abrading material

Abrasive grain (bauxite based, electric arc furnaced aluminium oxide) with a chemical composition according to Table 1 shall be used[4]. The abrasive mineral has a specific mass of 3,96 g/cm^3 and a Knoop hardness of 21 kN/mm^2. The medium grain shape of the mineral has a bulk density in the range of 1,51 g/cm^3 to 1,62 g/cm^3 according to FEPA standard 44-D. Particle size distribution ranges between 45 µm and 75 µm with a reduced fines portion according to Table 2 determined according to FEPA standard 42-D.

Table 1 — Chemical composition

Type of oxide	Al_2O_3	Fe_2O_3	SiO_2	TiO_2	CaO	ZrO_2	MgO
Mass-%	> 95	< 0,30	< 0,90	2,4 to 3,0	< 0,30	< 0,30	< 0,30

Table 2 — Grain distribution

Sieve No.	170	200	270	270 to -325	> 325
Grading in µm	90	75	53	45	
Grain distribution in %	0	0 to 5	≥ 45	≥ 80	0 to 10

The abrading material shall be stored in a dry place and shall be used only once. It shall not be sieved before use.

4.2.4 Leather abrading wheels

Two cylindrical wheels[5] free to turn on their axis with nominal diameter and width of respectively 44,4 mm and 12,7 mm. They are fitted with a leather strip of (12,7 ± 0,1) mm wide and with a minimum thickness of 1,5 mm. The overall diameter of the wheels, with leather strips, shall not exceed 52 mm or be less than 46 mm.

The hardness of the leather strips shall be suitable for the purpose. It is measured according to ISO 868 with a Shore durometer of Type A with the following deviation:

— the Shore-A hardness is measured at four points in the middle of the tire tread of the abrading wheels (deviation from ISO 868:2003, 5.1, 5.2 and 8.1).

The hardness of the leather is suitable if all the results are contained within the range A/1:85 to A/1:95.

The distance between the internal faces of the wheels shall be (52,5 ± 0,2) mm, their common axis being set, by (19,05 ± 0,3) mm nominally, off the axis of the specimen holder. The axis of rotation of the test piece shall be equidistant from the two wheels.

Prior to testing, new abrading wheels shall be preconditioned: Subject new wheels to an initial 2 000 cycle test following the procedure described in 7.2.

4.2.5 Stopwatch

A stopwatch accurate to ±0,1 s.

4.2.6 Grit collection container

A container of known mass to collect the grit when calibrating the grit feeder.

4) ALODUR® ESK 240 (EN 15354) is the trade name of a product supplied by IMERYS. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

5) The abrading wheels Taber® S-39 is the trade name of a product supplied by Taber Industries. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

4.2.7 Calibration plates

Calibration plates[6] made of cell-cast acrylics with Rockwell Hardness M 94 according to ASTM D785.

4.2.8 Transparent template to evaluate the wear of the abraded area

A transparent template shall be used for visual observation of wear-through. Each quadrant shall be divided into four sectors of 22,5° (see Figure 4).

NOTE There is no commercial source available. This template can be easily made from a transparent film.

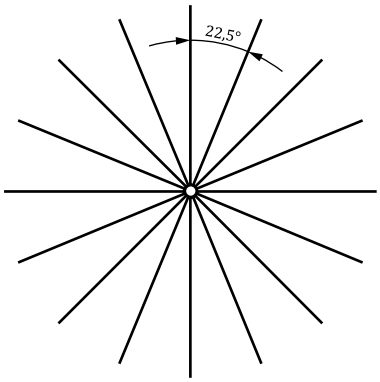


Figure 4 — Transparent template for visual observation of wear-through

4.3 Additional material or equipment (method A and B)

4.3.1 Weighing equipment

For determining the mass loss of the zinc plate by the sand paper or calibrating the grit flow of the abrading material, weighing equipment with an accuracy of ±1 mg is needed.

4.3.2 Conditioning chamber

The conditioning chamber shall be able to maintain a standard climate of (23 ± 2) ºC and (50 ± 5) % relative humidity.

5 Test specimens

For each method three laminate floor covering elements, taken at random are needed. Take from each element one test specimen, measuring approximately 100 mm x 100 mm:

— One specimen located at 10 mm from the left short edge of the first element (see Figure 5).

— one specimen exactly in the centre of the second element (see Figure 5).

— One specimen located at 10 mm from the right short edge of the third element (see Figure 5).

Machined edges and machined surfaces shall be avoided in the specimens. If the thickness of the specimens exceeds 8 mm the specimens shall be milled down from the backside to (7,5 ± 0,5) mm to ensure a horizontal load of the abrader arms. Make sure that specimens are uniformly flat and parallel after milling.

6) The calibration plates Taber® S-38 is the trade name of a product supplied by Taber Industries. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.