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Textile floor coverings — Determination of wool fibre integrity using an abrasion machine

Revêtements de sol textiles —Détermination de l'intégrité des fibres de laine à l'aide d'un abrasimètre

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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 subjected of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 17504 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 12, *Textile floor coverings*.

Annex A of this International Standard is for information only.

Textile floor coverings — Determination of wool fibre integrity using an abrasion machine

1 Scope

This International Standard specifies a method for the determination of fibre damage in the pile of textile floor coverings having a pile material of at least 80 % wool.

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 139, *Textiles — Standard atmospheres for conditioning and testing.*

ISO 1957, *Machine-made textile floor coverings — Sampling and cutting specimens for physical tests.*

3 Principle

Circular test specimens are abraded against a specified fabric for a set number of revolutions and the mass loss determined.

The abradant is mounted in a large head and the test specimen to be abraded is mounted in a smaller head. The heads are offset from each other and rotated at the same speed. This method gives a constant relative velocity over the surface of the test specimen and thus relatively even wear.

4 Apparatus

4.1 Carpet abrasion machine[1)]**,** consisting of a circular specimen holder rotating at approximately the same speed and in the same direction as the circular abradant but with the axes of rotation offset and having the following characteristics.

— Rotational speed of specimen holder and abradant holder: 2,6 s^{-1} ± 0,05 s^{-1} (156 rpm ± 3 rpm);

— Size of aperture of specimen holder: 800 mm^2 ± 10 mm^2;

— Size of aperture of abradant holder: 10 560 mm^2 ± 20 mm^2;

— Distance between axes of specimen holder and abradant: 25,4 mm ± 0,2 mm;

1) A suitable machine is available from: Wira Instrumentation, 3 Water Lane, Bradford BD1 2JL, UK.

— Abrading pressure: 53 kPa ± 1 kPa.

4.2 Standard abradant fabric[2], plainweave filter fabric having the following characteristics:

— material: polyester monofilament (round cross section);

— thread diameter: 150 µm ± 10 µm;

— mesh count: (23,3 ± 1) threads per cm (warp and weft);

— fabric thickness: 260 µm ± 10 µm;

— weight: 118 g/m^2 ± 5 g/m^2.

4.3 Standard felt backing, of wool felt of mass 750 gm^2 ± 50 gm^2 and with a thickness of 2,5 mm ± 0,3 mm.[3]

4.4 Weighing balance, capable of measuring loads in the region of 350 g with an accuracy of ± 10 mg.

4.5 Soft bristle brush, for removal of loosened fibre prior to weighings.

5 Sampling and preparation of test specimens

Using, e.g., a cutting die and press, cut with pile side uppermost, four circular test specimens of approximately 37,5 mm diameter from the material to be tested, in accordance with the procedure described in ISO 1957.

6 Conditioning

Condition the test specimens lying flat, pile side uppermost, in the standard atmosphere for testing textiles as defined in ISO 139, for a minimum of 24 h.

7 Test procedure

7.1 Mount a test specimen in the specimen holder taking care to ensure that the test specimen is flat. If necessary, trim the outer tufts to facilitate entry into the holder. Using a tensioning device (usually a torque wrench) clamp the test specimen in the holder with a tension of aproximately 6,5 N·m and brush any loose fibres/tufts from the pile surface.

7.2 Weigh the specimen holder complete with mounted test specimen and record the initial mass (m_i) to 10 mg accuracy.

7.3 Fit the specimen holder in position on the machine.

7.4 Insert a new disc of the standard abradant with the felt backing in the abradant holder and fit the holder into position on the machine.

A new piece of felt shall be used for each carpet. It shall be used for no more than 20 000 cycles in total and it shall be reversed after 10 000 cycles.

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[2] A suitable abradant fabric reference PE 280 Type is obtainable from Lockertex, PO Box 161, Warrington WA1 2SU, UK.

[3] A suitable wool felt, Type W16 and W18, is available from P & S Textiles Ltd., Hornby Street, Bury BL9 5BL, UK.

The above information and that given in footnote 1) on page 1 are given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the products. Equivalent products may be used if they can be shown to lead to similar results.

If heavily contaminated by fibres, observed by a change in colour, or by dust visible on the surface and unable to be removed, the felt shall be replaced.

7.5 Set the counter for 5 000 cycles, lower the abradant holder on to the test specimen and start the machine.

7.6 Remove the specimen holder from the machine, brush off any loosened fibres and weigh (complete with test specimen) within 2 min of the end of the abrasion treatment.

Record the final mass (m_f) to 10 mg accuracy.

7.7 If the test specimen shows wear to backing at 5 000 cycles the test shall be repeated using a shorter duration. The test duration shall be selected to be as long as possible without causing wear to backing (e.g. 3 500 cycles or 2 500 cycles).

8 Calculation and expression of results

8.1 Determine the mass loss for each of the 4 test specimens as follows:

$$m_L = m_i - m_f$$

where

m_L is the absolute mass loss in grams;

m_i is the initial mass of the test specimenin grams;

m_f is the final mass of test specimenin grams.

If an end point of $<$ 5 000 cycles is used the calculation is, e.g.:

$$m_L = 2\left(m_i - m_{f2,5}\right)$$

where $m_{f2,5}$ is the final mass of test specimen after 2 500 cycles.

In general,

$$m_L = \frac{5\,000}{NC}\left(m_i - m_{NC}\right)$$

where

NC is the number of cycles used;

m_{NC} is the final mas of test specimen, in grams, after *NC* cycles.

8.2 Calculate the average mass loss per 5 000 cycles, the standard deviation and the coefficient of variation.

9 Accuracy and precision

Accuracy (the extent to which the test method correctly predicts the real life performance of the product in terms of the property concerned) and precision (the extent to which test results can be reproduced within and between laboratories) have been determined for this test in a number of experimental programmes. The results and commentary are given in annex A.

10 Test report

The test report shall contain the following information:

a) reference to this International Standard, i.e. ISO 17504;

b) complete identification of the product tested including type, source, colour and manufacturer's reference;

c) previous history of the sample;

d) average mass loss per 5 000 cycles and coefficient of variation;

e) number of cycles, either 5 000 or 2 500;

f) any deviation from from this International Standard.

Annex A
(informative)

Accuracy and precision

Accuracy is defined as the extent to which the test method correctly predicts the real life performance of the product and property concerned. High accuracy means high correlation between laboratory test results and real life performance.

Precision is the extent to which test results can be reproduced within and between laboratories. High precision means low variance which may be expressed as standard deviation or standard error or as confidence limits, etc.

The test evaluates the integrity of the fibre to determine if the fibre has been damaged, either during the growth cycle (on the sheep) or in the processes of yarn manufacture and/or carpet manufacture.

Studies of wools of different origin have shown that wools from harsh climates and countries with “poor” management practices generally exhibit high rates of mass loss. These findings are consistent with damage to the fibre during the growth cycle.

Controlled tests involving carpets produced using wool fibres which had been systematically damaged have been carried out. The abrasion resistance of the carpets was evaluated by a number of means including alkali solubility and the rate of weight loss test. Alkali solubility test results are questionable unless the complete processing history of the fibre is known. This limits their general applicability as an abrasion resistance test. As the complete processing history of the fibres was available for these trials, the alkali solubility results were useful and showed a near-linear relationship to the rate of weight loss test (see Figure A.1).

Numerous case studies have also been established where high rates of weight loss have been found in cases of poor abrasion performance in practice for 100 % wool carpets.

General experience has shown that the coefficient of variation (CV) is often greater than 6 % when four specimens are tested. Extending the sample of six leads to a reduction in the CV but it is still often greater than 6 %.

Within laboratory repeatability has been evaluated in one study of 100 % wool carpets and found to be high. The mean difference in weight loss for each of the set of twenty-one samples was found to be 2,05 mg/1 000 cycles. The results for the set of samples involved in the trial covered the range (26–69) mg/1 000 cycles.

Between laboratory reproducibility has been evaluated in a trial involving two laboratories and thirty-nine carpet samples. All of the carpet samples had a 100 % wool pile. The mean difference in mass loss for each of the sets of specimens was 0,953 mg/1 000 cycles. The results for the set of samples invoved in the trial covered the range of 31 mg/ 1 000 cycles to 75 mg/1 000 cycles.

The regression equation for the results from the two laboratories was found to be:

Laboratory 1 result = 0,975 × Laboratory 2 result