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**Textile floor coverings — Assessment of  
changes in appearance**

*Revêtements de sol textiles — Évaluation des changements d'aspect*

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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 9405 was prepared by Technical Committee ISO/TC 219, *Floor coverings*.

This first edition cancels and replaces ISO/TR 9405:1990 which has been upgraded to the status of International Standard.

Annex A forms a normative part of this International Standard.

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## Introduction

In 1980, a number of areas of work for improving the methods of assessing changes in appearance of textile floor coverings were agreed, including experiments aimed at developing the use of sets of fatigued specimens as reference scales to assist in the assessment of the changes. Conclusions drawn from the results of inter-laboratory trials indicated that carefully selected reference scales aided the assessment of appearance changes in textile floor coverings. However, members expressed concern over the widespread introduction of procedures based on reference scales because of possible problems such as constancy of production and stability in use.

Further work was requested before the method was to be published as a full International Standard and a Technical Report (type 2) describing the procedures for using reference scales to assist in the overall assessment of appearance change was published in 1990. Subsequently a modified version of the assessment procedure was adopted by CEN and has been published as EN 1471:1996.

In 1996 TC 38/SC 12 decided to develop ISO/TR 9405 into a full International Standard describing the best available method of subjective visual assessment of appearance retention testing. The first Draft International Standard (DIS) reflected the progress made by both the CEN and ISO committees and the DIS.2 reflected further progress in that it introduced the option of using digital image reference scales as an alternative to the carpet sample reference scales.

Following assessments of the digital image reference scales by a number of laboratories in Europe and North America, TC 38/SC 12 decided, in its meeting in November 1999, to issue for approval a Final Draft International Standard (FDIS) in which the digital images were the only reference scales. The document incorporates two alternative methods for using these scales in the assessment procedure, method A based on the European and method B based on the North American experiences.

[ISO 9405:2001](http://standards.iso.org/iso/9405:2001)

Proof of the equivalent applicability of the two methods is not yet available but it is intended that further work be carried out with a view to establishing one definitive method in the next edition of this International Standard.

# Textile floor coverings — Assessment of changes in appearance

## 1 Scope

This International Standard describes the procedures for assessing the overall change in appearance of textile floor coverings caused by Vettermann drum and hexapod tumbler testers in accordance with ISO 10361 or other appropriate methods.

## 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 105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour*.

ISO 2424, *Textile floor coverings — Vocabulary*.

ISO 10361, *Textile Floor coverings — Production of changes in appearance by means of Vettermann drum and hexapod tumbler testers*.

## 3 Terms and definitions

For the purposes of this International Standard, the relevant definitions of the change in appearance given in ISO 2424 apply, in addition to the following definition.

### 3.1

#### **overall change in surface appearance**

difference between a fatigued and an unfatigued specimen where the degree of change is expressed by reference to standard digital image reference scales and by reference to large grey scales; grade 5 represents no change and grade 1 is extreme change

**NOTE** Changes in structure, roughness, colour and/or pattern of a textile floor covering may contribute to overall change in appearance. It is not always possible to distinguish clearly between the factors since each can have an interaction with others.

## 4 Principle

The change in appearance of a specimen after a process of fatiguing is assessed by visual comparison with standard digital image scales. The dominant factors (structure, roughness, colour and/or pattern) of the change are observed and recorded.

## 5 Apparatus

### 5.1 Digital image reference scales, for assessing appearance change.

See Table 1.

Eleven sets of eight scales showing reference levels of overall change in appearance from grade 5,0 (no change) to grade 1,0 (extreme change) including half grades. Each scale consists of two zones:

- an "original" zone (grade 5,0);
- a "fatigued" zone representing the defined grade of change in appearance.

**Table 1 — Digital image scales<sup>1)</sup>**

Scale	Description
ISO A	Loop, low level
ISO B	Cut pile frisé (knitted)
ISO C	Cut pile (tufted with foam back)
ISO D	Cut pile (tufted cross-over)
ISO E	Berber (wool tufted)
ISO F	Cut pile Saxony
ISO G	Cut pile (woven Axminster)
ISO H	Cut pile (wool)
ISO I	Rib (pile needlefelt)
ISO J	Velour (pile needlefelt)
ISO K	Hairy (pile needlefelt)

## 6 Selection and preparation of specimens

Select specimens for fatiguing and assessment that are representative of the carpet and also a corresponding area of at least 20 cm × 20 cm of the unfatigued sample. Mark the specimens with a reference direction (which may be the direction of production, if known) for aligning them for the assessment.

## 7 Assessment of overall change – method A

### 7.1 Apparatus

**7.1.1 Illumination device**, comprising sufficient fluorescent tubes of correlated colour temperature between 5 000 K and 6 000 K mounted at such a height above the viewing table as to give an intensity of light across the viewing platform of 1 500 lx ± 200 lx and in such a way as to illuminate the specimens vertically from above and allow uninterrupted viewing of the table (minimum height 1 600 mm above table). The surroundings shall be neutral and darkened.

<sup>1)</sup> Supplied by Carpet and Rug Institute (CRI), Box 2048, 310 Holiday Avenue, Dalton, Georgia 30722, USA and by European Carpet Association (ECA), 24 rue Montoyer, B-1000, Brussels, Belgium.

This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of these products.

The intensity of the light shall be checked prior to each assessment series by the use of a luxmeter. The lifetime of the tubes, as given by the manufacturer, shall not be exceeded.

**7.1.2 Rotary viewing table**, enabling the specimens to be rotated so that they may be viewed from all directions under the standard illumination. The diameter of the viewing table shall be at least 1 000 mm in order to enable the test specimens and the digital image reference scales to be laid side-by-side. The colour shall be matt dark grey or matt black. The table shall be constructed in such a way that its surface is as close as possible to the floor to achieve a 45° angle with respect to the eyes of the assessors.

**7.1.3 Large grey scales**<sup>2)</sup>, comprising five pairs of grey references (200 mm × 150 mm) each representing a contrast corresponding to grade 5,0; 4,0; 3,0; 2,0 or 1,0 (see ISO 105-A02). These scales are used for assessing changes in colour. Scales including intermediate half-grades (nine pairs) may also be used.

NOTE The use of normal (35 mm × 28 mm) grey scales may lead to incorrect assessment and these cannot therefore be used.

## 7.2 Assessors

The assessments shall be made independently by at least three persons. Should the difference between the individual test results within an assessor team be greater than one grade, the number of assessors shall be extended to five and the assessments carried out by the two additional assessors.

The assessors shall sit around the rotating table at a distance of approximately 0,5 m to the periphery, so that they view the specimens from a distance of approximately 1,5 m to 1,8 m and at an angle of approximately 45°.

Each assessor shall grade the specimens independently from the other assessors.

## 7.3 Procedure

Switch on the illumination device at least one hour before the assessment session to allow the fluorescent tubes to reach their full operating output.

Select an appropriate digital image reference scale set that nearest resembles the construction of the textile floor covering being assessed (see Table 1).

Ensure that the specimens have been vacuum cleaned and conditioned following treatment for production of changes in appearance (see ISO 10361).

Arrange the fatigued and the unfatigued specimens side-by-side on the rotating table, in the same reference direction and positioned centrally under the illumination device. Lay the selected scale side-by-side with the specimens.

Select a viewing position to eliminate as much as possible any inconvenient reflection from the surface of the digital image scales.

Assess the contrast between the fatigued and unfatigued specimens by comparing against the appropriate grade of reference scale. Assess the contrast from all directions by slowly rotating the table.

When turning the table, the appearance of the specimens may be variable. In such a case an integration of the worst and the best impressions shall be made by each assessor.

During the assessment consider the changes of structure, roughness, colour and/or pattern and such features as crushing, loss of tuft definition and matting, awarding the final grade as the integrated average of all the factors when viewed from all directions. Half grades may be awarded.

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2) Supplied by BSI, 389 Chiswick High road, London W4 4AL, U.K.

One or more of the factors may have an overriding influence in the final grade, if so each assessor shall record the factor(s) for information.

## 7.4 Assessment of colour change

In addition to including influence of colour in the above overall assessment, a separate assessment of colour change is required. The colour change in the worst direction shall be assessed using the large grey scales. A correction of the individual overall grade – adding a half grade – shall be made when the assessed colour change is grade 2,0 or less.

**NOTE** The overall assessment of appearance changes of treated specimens is sometimes influenced by the appearance of a sharp colour contrast over a very small distance on the test specimen. In practice however, any colour change due to flattening fibrillation or chalking is normally not so pronounced, being obscured by soiling and taking place more gradually and over larger distances. Correction of the assessment is therefore necessary to give a better relationship to real usage.

## 7.5 Precision

Eight carpet samples were assessed by five European laboratories using method A with the digital image scales in comparison with the physical carpet scales (see EN 1471). Although glossing of the digital image scales was found to present some difficulties in viewing, the median result of all assessors was comparable for the two types of scales.

## 8 Assessment of overall change – method B

### 8.1 Apparatus

**8.1.1 Masks**, for use in viewing the unfatigued and fatigued specimens. They are made from cardboard or other suitable material and are non-reflective dark grey in colour with an aperture of 300 mm × 200 mm.

**8.1.2 Illumination system for assessment**, portable or fixed lighting that provides 1 500 lx ± 200 lx illumination at the surface with a predominance of the light from directly above. Either north sky light or fluorescent light may be used.

**8.1.3 Upright vacuum cleaner**, dual motor, top-loading, with a rotating brush.

### 8.2 Assessors

At least three assessors shall grade the specimens and each assessor shall grade each specimen independently of the other assessors.

If the difference between the individual test results within an assessing team is greater than one grade, then the number of assessors shall be increased by two.

### 8.3 Procedure

Vacuum clean all specimens and allow to recover under ambient room conditions, undisturbed, for a minimum of 24 h prior to grading.

**NOTE** Do not stack carpet specimens. Care should be exercised to prevent contact with the pile surface.

Place unfatigued and fatigued specimens under and perpendicular to the specified lighting (8.1.2) such that the unfatigued specimen is adjacent to the trafficked portion of the fatigued specimen.

Place the mask (8.1.1) over the specimens located in such a way that one-half of the aperture of the mask reveals the unfatigued specimen and the other half reveals the maximum wear area of the fatigued specimen. Make sure



both specimens are in the same orientation with regard to pile direction. Pile may be lightly stroked one or two times with the edge of the hand during the evaluation.

Select the appropriate digital image reference scale set (see Table 1) that nearest resembles the construction of the pile yarn floor covering being assessed. Observing such features as crushing, loss of tuft definition and matting, choose the digital image reference scale grade that nearest resembles the degree of surface appearance change of the exposed specimen.

**NOTE** Some specimens may display noticeable variation in appearance change within same fatigued area. If these exist, and are considered as a rating variable, note in the report the type of variation, e.g., pile reversal, small spot distortion, colour change, fuzzing or other.

Assess the specimens by observing from a distance of 0,5 m to 1 m, at an angle 45° to 90° to the specimen and from various directions and rate the greatest degree of surface change.

Record the individual grades for each specimen to the nearest 0,5 grade.

#### 8.4 Precision

No precision data is currently available for method B.

### 9 Test report

The report shall include the following information:

- a) all details necessary for identification of the specimens;
- b) the method and duration of fatiguing the specimens;
- c) that the assessment was carried out in accordance with this International Standard;
- d) the date the test was completed;
- e) the assessment method used, i.e. method A or method B;
- f) the median of the (corrected) individual grades for overall change in surface appearance for method A (if applied);
- g) the median of the individual grades for greatest change in surface appearance for method B (if applied);
- h) the change of characteristics listed in 7.3 or 8.3;
- i) the median of the colour change according to 7.4, method A (if applied);
- j) any deviations from the methods specified in this International Standard.