BRITISH STANDARD

BS EN
1471 : 1997

Textile floor coverings — Assessment of changes in appearance

The European Standard EN 1471 : 1996 has the status of a British Standard

ICS 59.080.60

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee TCI/3, Textile floor coverings, upon which the following bodies were represented:

British Apparel and Textile Confederation
British Carpet Manufacturers' Association Ltd.
British Polyolefin Textiles Association
British Shops and Stores Association (BSSA)
British Textile Technology Group
Confederation of British Wool Textiles Limited
Consumer Policy Committee of BSI
Contract Flooring Association
Entrance Flooring Systems Association
Fibre Bonded Carpet Manufacturers' Association
Health Care Supplies South West
Institute of Trading Standards Administration
International Wool Secretariat
Sgs United Kingdom Ltd.
Wools of New Zealand

This British Standard, having been prepared under the direction of the Sector Board for Materials and Chemicals, was published under the authority of the Standards Board and comes into effect on
15 June 1997

Amendments issued since publication

Amd. No.	Date	Text affected

The following BSI references relate to the work on this standard:
Committee reference TCI/3
Draft for comment 94/340693 DC

ISBN 0 580 27334 2

Contents

National foreword

This British Standard has been prepared by Technical Committee TCI/3 and is the English language version of EN 1471 : 1996 *Textile floor coverings — Assessment of changes in appearance*, published by the European Committee for Standardization (CEN). It supersedes BS 6659 : Part 1 : 1986, which is withdrawn.

At the Formal Vote stage, the UK voted against prEN 1471 because it considered that the scope of this test method should be restricted to use with the specific pieces of test apparatus for which it is suitable, i.e. Vettermann drum and Hexapod tumbler. It considered that the current wording, which allows use of the method for assessing changes caused by 'any testing device', is much too broad and that the 'state of the art' referred to in the Scope clause should be described in a Precision clause.

Annex NA provides information on the limitations of the standard for any organization using it as the basis of classification or guidance.

The committee would welcome comments arising from any aspect of the application of this standard. These would be considered at the first review of the standard.

Cross-references

Publication referred to	Corresponding British Standard
EN 20105 : A02 : 1994	BS EN 20105 *Textiles — Tests for colour fastness* Part A02 : 1994 *Grey scale for assessing change in colour*
ISO 2424 : 1992	BS 5557 : 1992 *Textile floor coverings — Vocabulary*

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 8, an inside back cover and a back cover.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1471

December 1996

ICS 59.080.60; 91.180

Descriptors: Floor coverings, textile floor coverings, estimation, appearance, variation, colourfastness

English version

Textile floor coverings — Assessment of changes in appearance

Revêtements de sol textiles — Evaluation des changements d'aspect

Textile Bodenbeläge — Beurteilung der Aussehensveränderung

This European Standard was approved by CEN on 1996-11-25. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 134, Resilient and textile floor coverings, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 1997, and conflicting national standards shall be withdrawn at the latest by June 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard describes procedures for assessing the changes in appearance of textile floor coverings caused by any testing device. This standard reflects the existing state of the art.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 20105 : A02	*Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour* (ISO 105-A02 :1993)
ISO 2424	*Textile floor coverings — Vocabulary*

3 Definitions

For the purpose of this European Standard, the following definitions are based on those in ISO 2424 .

3.1 overall change in surface appearance

The assessed overall change of appearance is the difference between a fatigued and an unfatigued specimen. The degree of change is expressed by a single overall grade. Changes in structure, thickness, 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 may have an interaction with others.

3.1.1 change in structure; textural change

Visible change in configuration of loops and tufts and/or fibres at the use-surface of a textile floor covering.

3.1.1.1 loss of tuft definition

The bursting, opening and untwisting of the pile yarn, and/or decrimping of the fibres, in the use-surface of a textile floor covering. This can cause a decrease of the pile definition.

3.1.1.2 crushing; flattening

Loss of thickness of a textile floor covering under the action of a static or dynamic load.

3.1.1.3 felting; matting

Loss of pile definition of a textile floor covering due to entanglement and compression of pile fibres.

3.1.2 Surface roughening

3.1.2.1 hairiness; filamentation

The protrusion of fibres above the normal level of the use-surface of a textile floor covering and not removable by brushing or suction.

3.1.2.2 cobwebbing

An extreme form of hairiness/filamentation in which the fibres are entangled to form an interlaced web attached to the use-surface.

3.1.2.3 pilling

An extreme form of hairiness/filamentation in which the fibres are entangled to form small aggregates, attached to the use-surface, which may or may not include fibres from other sources.

3.1.2.4 sprouting

The release and appearance during use of extra-long tuft legs which were accidentally trapped within the pile of a textile floor covering during manufacture.

3.1.3 change of pattern definition

Change in the colour appearance of patterned textile floor coverings due to mechanical action. A change of pattern definition may be caused by a change in the clarity of the contour lines.

3.1.4 change in colour

The change or apparent change in colour, assessed by a large grey scale, that may result from one or more of the following:

- change in orientation of the pile (shading);
- whitening/chalking;
- fading;
- glossing;
- colour bleeding;
- staining;
- soiling.

4 Principle

The overall change in appearance of a fatigued specimen is assessed by visual comparison with reference scales. The dominant factors (structure, roughening, pattern, colour) are reported when appropriate.

5 Apparatus

5.1 *Illumination device*, comprising sufficient fluorescent tubes[1)] of correlated colour temperature 5200 K ± 300 K, mounted at a height above the viewing table to give an intensity of light across the viewing platform of 1500 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 1600 mm above table). The surroundings shall be neutral and darkened.

The intensity of the light shall be checked by the use of a luxometer. The lifetime of the tubes, as given by the manufacturer, shall not be exceeded.

5.2 *Rotary viewing table*, enabling the specimens to be viewed from all directions under the standard illumination. The diameter of the viewing table is at least 1000 mm to enable the test specimens and references to be laid side-by-side. The colour shall be matt dark neutral grey. The table shall be constructed so that its surface is as close as possible to the floor, to achieve a 45° angle to the eyes of the assessors.

5.3 *Large grey scale*, for assessing change in colour, comprising five pairs of grey reference shades (200 mm × 150 mm), each representing a contrast corresponding to grade 5, 4, 3, 2 or 1 (see EN 20105-A02). Scales including intermediate half-grades may also be used. The use of small (35 mm × 28 mm) grey scales may lead to incorrect assessment and these may not therefore be used.

5.4 *Reference scales*, for the assessment of the appearance change of textile floor coverings, comprising 11 sets of five pairs, showing reference levels of overall change in appearance from grade 5 (no change) to grade 1 (extreme change), each pair including two zones:

- an 'original' zone;
- a 'fatigued' zone representing the defined grade of change in appearance.

The description and sources of the 11 reference scales produced from different types of textile floor coverings are given in annex A.

6 Selection and preparation of specimens

Select for fatiguing and assessment specimens which are representative of the carpet sample, and also a corresponding area of at least 200 mm × 200 mm for the unfatigued sample. Mark the specimens with a reference direction (which may be the direction of production, if known) in order to be able to align them in the same direction for the assessment.

7 Assessment procedure

7.1 General

The assessments shall be made independently by at least three experienced assessors.

NOTE. The assessor should acquire experience in assessing and should undertake comparative assessments with other laboratories at regular intervals (e.g. twice a year).

Switch on the illumination device (**5.1**) at least 1 **h** before the assessment session, to allow the fluorescent tubes to reach their full operating output.

The assessors shall sit around the rotating table (**5.2**) 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°.

Select an appropriate reference scale (see annex A).

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

If specimens of one article are treated in steps of increasing intensity (e.g. castor chair test) they have to be assessed together.

7.2 Overall change procedure

Each assessor shall assess the contrast between the fatigued and unfatigued specimens by comparing against the grades of the reference scale. The contrast shall be assessed from all directions whilst the table is slowly rotated.

As the table is turned, the appearance of the specimens may vary. In that case, an average of the worst and the best impression shall be made by each assessor.

When assessing the specimens, the individual appearance change factors mentioned in clause **3** shall be considered, the final grade being the overall average of all the factors viewed in all directions. Half grades may be awarded.

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

For each specimen, note the individual grade selected from the appropriate reference scale (**5.4**).

7.3 Change-of-colour procedure

Each assessor shall assess the colour change in the worst direction with the large grey scale. For each specimen, note the individual grade selected on the large grey scale (**5.3**).

[1)] Fluorescent tubes such as PHILIPS TLD 95 are suitable.

8 Calculation and expression of results

8.1 Overall change of appearance

8.1.1 *Determination of corrected overall change-of-appearance grade* (if necessary)

Each assessor shall add one half grade to all assessments of overall appearance change in cases where the colour change has been assessed as grade 2 or less.

NOTE. An overall assessment is sometimes influenced by severe colour contrast which appears on test specimens as a sharp contrast over a very small distance. In practice, however, any colour change due to flattening is normally not so pronounced, being obscured by soiling and taking place more gradually and over larger distances. A correction of the assessment is necessary therefore to give a better relationship to real usage.

8.1.2 *Action in case of large differences in assessed grades*

If the difference between the individual test results (**7.2**) (after colour correction) within an assessor team is one grade or more, the number of assessors shall be increased to five and the assessments carried out by the two additional assessors.

8.1.3 *Calculation of the overall appearance-change grade*

Calculate the median of all the corrected overall appearance-change grades.

8.2 Change of colour

8.2.1 *Action in case of large differences in assessed grades*

If the difference between the individual test results (**7.3**) within an assessor team is one grade or more, the number of assessors has to be increased to five.

8.2.2 *Calculation of the colour-change grade*

Calculate the median of all the colour-change grades.

9 Test report

The report shall include the following information:

a) that the assessment was carried out in accordance with this European Standard, i.e. EN 1471;

b) all details necessary for identification of the specimens;

c) the method of test and duration of fatiguing the specimens;

d) the individual assessment grades for overall change of appearance (**7.2**);

e) the individual overall grade after colour correction (**8.1**);

f) the median grade for overall change of appearance (**8.1**);

g) the individual assessment for change of colour (**7.3**);

h) the median grade for change of colour (**8.2**);

i) the dominant change characteristics defined in clause **3**;

j) any deviations from this method.

Annex A (normative)

Constructional details of types of textile floor covering available as reference fatigued specimens

Sets of reference fatigued specimens (reference scales) are available in 11 types of textile floor covering construction, the details of which are given in table A.1.

Table A.1 Constructional details of reference scales

Ref.	Surface	Pile/surface fibre	Type of manufacture	Secondary backing	Gauge/pitch	Stitch/row	Thickness		Mass		Density of use-surface	Supplier[1)]
							Total	Above backing	Toal	Above backing		
					dm^{-1}	dm^{-1}	mm	mm	$g \cdot m^{-2}$	$g \cdot m^{-2}$	$g \cdot cm^{-3}$	
A	Loop	PP	Tufted, low level	Foam	25	40	8,7	4,1	2070	475	0,116	TFI
B	Cut-frise	WO	Knitted	—	24	39,5	8,7	5,8	1680	775	0,133	TNO
C	Cut	PA	Tufted	Foam	39	66	8,5	4,2	2270	430	0,102	CSTB
D	Cut	WO/PA	Tufted crossover	Woven fabric	25	30	10,5	6,5	2700	660	0,102	DESSO
E	Loop	WO	Tufted Berber	Woven fabric	12,6	26	9,6	5,7	2090	560	0,098	IWS
F	Cut	PA	Tufted Saxony	Woven fabric	31	38	17	15	2480	1300	0,087	LDM
G	Cut	WO/PA	Woven Axminster	—	28	29	9,3	6,2	1970	750	0,121	IWS
H	Cut	WO	Tufted plain	Woven fabric	35	53	11,8	8,7	2470	1260	0,145	IWS
I	Rib	PP/PA/CV	Pile needlefelt	—	—	—	6,2	—	1020	—	—	BCTC
J	Velour	PP/PA	Pile needlefelt	—	—	—	10,0	—	1300	—	—	BCTC
K	Hairy	PA/CV/hair	Pile needlefelt	Non-woven	—	—	7,3	3,1	3720	420	0,135	HEUGA

[1)] TFI: Deutsches Teppich-forschungsinstitut, Germanusstraße 5, D 52080 Aachen, Germany.
TNO: Centre for Textile Research, Schoemakerstraat 97, PO Box 6034, 2600 JA. Delft, Netherlands.
CSTB: 84 Avenue Jean Jaurès, BP 02, Champs sur Marne, 77421 Marne La Vallée, France.
LDM: Grotesteenweg Nord 2, Ghent State University, B 9710 Gent, Belgium.
BCTC: WIRA House, West Park Ring Road, Leeds LS16 6QL, United Kingdom.
HEUGA: 15 Industrielaan Post Bus 16, 3925 ZG Scherpenzeel, Netherlands.
TAPIJTFABRIEK H. DESSEAUX N.V., 89 Rob Ramlotstraat, 9200 Dendermonde, Belgium.

Annex NA (informative)

Precision of the EN 1471 assessment procedure, and its effect on classification

NA.1 Precision

The perception of change in the appearance of textile floor coverings is subjective. The importance given to such change varies between individuals and between countries.

ISO/TC 38/SC 12, Textile floor coverings, has carried out an extensive interlaboratory trial of the assessment procedures given in EN 1471. This trial showed that most of the difference in results between laboratories is due to the imprecision of the procedures, and that for laboratories using three assessors the expected standard error for the mean result is 0.45 grade units. This means that if a number of laboratories test and assess a carpet, one third of results will fall outside a range of ± 0.45 grade units about the grade mean result (i.e. a spread of 0.9 grade units) and one in 20 results will fall outside ± 0.9 grade units (i.e. a spread of 1.8 grade units).

EN 1471 is specified in EN 1307[2)] as the assessment procedure by which carpets are classified for change of appearance. Since each change-of-appearance class in EN 1307 differs from its neighbours by only 0.5 grade units, classification differences of one class between laboratories will be frequent, and of two classes not infrequent. Even a three-class difference could arise by chance, on the basis of the observed variability of the results between laboratories.

The interlaboratory trial also showed that the training of assessors has a very limited effect on the extent of agreement between laboratories.

NA.2 General advice to users of the standard

This standard will give the correct classification of carpets in the majority of cases. However, in a significant minority of cases an incorrect classification will be given, due either to the inaccuracy of the methods or to the variability of the appearance assessment.

In cases of disputed classification, good real-life commercial evidence of the performance of particular carpet types, or evidence from valid and relevant user trials, should be regarded as more authoritative than the standard in its present form.

[2)] EN 1307 : 1997 *Textile floor coverings — Classification of pile carpets*.

List of references

See national foreword.

BS EN 1471 : 1997

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Contract requirements

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the responsible technical committee, the identity of which can be found on the inside front cover. Tel: 0181 996 9000; Fax: 0181 996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services, Sales Department at Chiswick: Tel: 0181 996 7000; Fax: 0181 996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library, the Standardline Database, the BSI Information Technology Service (BITS) and its Technical Help to Exporters Service. Contact the Information Department at Chiswick: Tel: 0181 996 7111; Fax: 0181 996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Customer Services, Membership at Chiswick: Tel: 0181 996 7002; Fax: 0181 996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL