BS EN 438-5:2016

BSI Standards Publication

High-pressure decorative laminates (HPL) — Sheets based on thermosetting resins (usually called laminates)

Part 5: Classification and specifications for flooring grade laminates less than 2 mm thick intended for bonding to supporting substrates

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National foreword

This British Standard is the UK implementation of EN 438-5:2016. It supersedes BS EN 438-5:2005 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/76, Laminated sheet for decorative purposes.

A list of organizations represented on this committee can be obtained on request to its secretary.

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High-pressure decorative laminates (HPL) - Sheets based on thermosetting resins (usually called laminates) - Part 5: Classification and specifications for flooring grade laminates less than 2 mm thick intended for bonding to supporting substrates

Stratifiés décoratifs haute pression (HPL) - Plaques à base de résines thermodurcissables (communément appelées stratifiés) - Partie 5: Classification et spécifications des stratifiés pour revêtement de sols d'épaisseur inférieure à 2 mm destinés à être collés sur des supports

Dekorative Hochdruck-Schichtpressstoffplatten (HPL) - Platten auf Basis härtbarer Harze (Schichtpressstoffe) - Teil 5: Klassifizierung und Spezifikationen für Schichtpressstoffe für Fußböden mit einer Dicke kleiner 2 mm, vorgesehen zum Verkleben auf ein Trägermaterial

This European Standard was approved by CEN on 13 December 2015.

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European foreword

This document (EN 438-5:2016) has been prepared by Technical Committee CEN/TC 249 “Plastics”, the secretariat of which is held by NBN.

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of an identical text or by endorsement, at the latest by August 2016, and conflicting national standards shall be withdrawn at the latest by August 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 438-5:2005.

EN 438, *High-pressure decorative laminates (HPL) — Sheets based on thermosetting resins (usually called laminates)*, consists of the following parts:

— *Part 1: Introduction and general information*

— *Part 2: Determination of properties*

— *Part 3: Classification and specifications for laminates less than 2 mm thick intended for bonding to supporting substrates*

— *Part 4: Classification and specifications for Compact laminates of thickness 2 mm and greater*

— *Part 5: Classification and specifications for flooring grade laminates less than 2 mm thick intended for bonding to supporting substrates*

— *Part 6: Classification and specifications for Exterior-grade Compact laminates of thickness 2 mm and greater*

— *Part 7: Compact laminate and HPL composite panels for internal and external wall and ceiling finishes*

— *Part 8: Classification and specifications for design laminates*

— *Part 9: Classification and specifications for alternative core laminates*

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1 Scope

This European Standard applies to six classes of flooring grade laminates less than 2 mm thick produced by using a high pressure process, intended for bonding to supporting substrates, to produce HPL flooring elements. For laminate floor covering applications they meet the surface property requirements specified in EN 13329.

High-pressure decorative flooring laminates are characterised by their high resistance to abrasion, aesthetic qualities and durability. They have good hygienic and anti-static properties and are easy to clean and maintain.

The requirements in this document apply only to the high-pressure laminate, and additional properties will need to be specified in order to define the functional performance of the finished flooring product.

This European Standard applies only to decorative laminates as defined in Clause 3.

EN 438-2 specifies the methods of test relevant to this European Standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 316, *Wood fibre boards — Definition, classification and symbols*

EN 438-2:2016, *High-pressure decorative laminates (HPL) — Sheets based on thermosetting resins (usually called laminates) — Part 2: Determination of properties*

EN 12721, *Furniture — Assessment of surface resistance to wet heat*

EN 13329, *Laminate floor coverings — Elements with a surface layer based on aminoplastic thermosetting resins — Specifications, requirements and test methods*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

EN 13722, *Furniture — Assessment of the surface gloss*

EN 16094, *Laminate floor coverings — Test method for the determination of micro-scratch resistance*

EN 61340-4-1, *Electrostatics — Part 4-1: Standard test methods for specific applications — Electrical resistance of floor coverings and installed floors (IEC 61340-4-1)*

EN ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pyknometer method and titration method (ISO 1183-1)*

EN ISO 9239-1, *Reaction to fire tests for floorings — Part 1: Determination of the burning behaviour using a radiant heat source (ISO 9239-1)*

EN ISO 10874, *Resilient, textile and laminate floor coverings — Classification (ISO 10874)*

EN ISO 11664-2, *Colorimetry — Part 2: CIE standard illuminants (ISO 11664-2)*

EN ISO 11925-2, *Reaction to fire tests - Ignitability of products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2)*

3 Terms and definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
high-pressure decorative laminate(s)
HPL
sheet(s) consisting of decorative surface layer(s) and core layers bonded together by an high pressure process

Note 1 to entry: Typical values for the high pressure process are a temperature of ≥ 120 °C and a pressure of ≥ 5 MPa.

3.1.2
surface layer
upper decorative layer consisting in one or more sheets of fibrous material (usually paper) impregnated with aminoplastic thermosetting resins (usually melamine based resins)

Note 1 to entry: The surface layer(s) on one side, having decorative colours or designs, are impregnated typically with melamine based resins and may contain special surface additives to improve abrasion resistance.

Note 2 to entry: The back of the sheet(s) is made suitable for adhesive bonding to a substrate.

3.1.3
core layer
fibrous material (usually paper) impregnated with thermosetting resins (usually phenolic based resins)

3.2 Symbols

For the purpose of this document, the following symbol applies.

t nominal thickness

4 Classification system

The classification system makes reference to EN ISO 10874 (level of use) in combination with the abrasion class (AC) given by a numerical rating of 1 to 6 defining the level of abrasion resistance, 6 being the highest and 1 the lowest performance.

Table 1 shows how the six abrasion classes of flooring grade laminate relate to level of use and some examples of typical applications.

Flooring grade laminates are specified according to abrasion class e.g. HPL/EN 438-5/AC1.

Table 1 — Classification system and typical applications

EN ISO 10874 classification	Level of use	Description	Examples of applications	Abrasion class
21	Moderate domestic	Residential areas with low or intermittent use	Bedrooms	AC1
22	General domestic	Residential areas with medium use	Living rooms, entrance halls	AC2
23	Heavy domestic	Residential areas with intense use	Living rooms, entrance halls	AC3
31	Moderate commercial	Commercial areas with low or intermittent use	Hotel rooms, small offices, hotels boutiques	
32	General commercial	Commercial areas with medium use	Classrooms, small offices, hotel boutiques	AC4
33	Heavy commercial	Commercial areas with heavy use	Corridors, department stores, schools, multipurpose halls, open plan offices	AC5
34	Very heavy commercial	Commercial areas with very heavy use	Airports, multi-purpose halls, counter halls, department stores	AC6

5 Requirements

5.1 Compliance

Laminates classified in Table 1 shall meet all appropriate requirements specified in 5.2, 5.3, and 5.4. This applies to both full-size sheets and cut-to-size panels.

5.2 Inspection requirements

5.2.1 General

Inspection shall be carried out in accordance with EN 438-2:2016, Clause 4 at a distance of 1,5 m.

5.2.2 Colour and pattern

When inspected in daylight or D65 standard illuminant, as specified in EN ISO 11664-2, and also under tungsten filament lightning illuminant A as specified in EN ISO 11664-2, a slight difference between the corresponding colour reference sample held by the supplier and the specimen under test is acceptable.

NOTE Where colour and surface finish are critical, it is advised that sheets be checked for colour and surface-finish compatibility before fabrication or installation.

5.2.3 Surface finish

When inspected at different viewing angles, there shall be no significant difference between the corresponding surface-finish reference sample held by the supplier and the specimen under test.

The maximum permitted deviations for the gloss value determined according to EN 13722 are:

Gloss surface	> 70	GU	maximum deviation ± 15 GU
Semi Gloss surface	30 – 70	GU	maximum deviation ± 10 GU

Semi Matt surface	10 – 30	GU	maximum deviation ± 5 GU
Matt surface	< 10	GU	maximum deviation ± 3 GU

GU= gloss units

The measurement shall be carried out with the same device as comparison between reference sample and specimen or between different lots of specimen.

NOTE Where colour and surface finish are critical, it is advised that sheets be checked for colour and surface-finish compatibility before fabrication or installation.

5.2.4 Reverse side

The reverse side of sheets shall be suitable for adhesive bonding (e.g. sanded). In the case of sanded backs, slight chatter marks are permitted.

5.2.5 Visual inspection

5.2.5.1 General

The following inspection requirements are intended as a general guide, indicating the minimum acceptable quality for laminates. It should be noted that only a small percentage of sheets in a batch (the level to be agreed with the customer) should contain defects of the minimum acceptable level.

5.2.5.2 Surface quality

The following surface defects are permissible:

a) dirt, spots and similar surface defects.

The admissible size of such defects is based on a maximum contamination area equivalent to 1,0 mm^2/m^2 of laminate and is proportional to the sheet size under inspection.

The total admissible area of contamination may be concentrated in one spot or dispersed over an unlimited amount of smaller defects.

b) fibres, hairs and scratches.

The admissible size of defects is based on a maximum contamination length equivalent to 10 mm/m^2 of laminate and is proportional to the sheet size under inspection.

The total admissible length of contamination may be concentrated in one defect or dispersed over an unlimited amount of smaller defects.

5.2.5.3 Edge quality

Visual defects (e.g. moisture marks, lack of gloss, corner damage, etc.) can be present on all four edges of the laminate, providing the defect-free length and width are at least the nominal size minus 10 mm.

5.3 Dimensional tolerance requirements

Dimensional tolerance requirements are specified in Table 2.

Table 2 — Dimensional tolerance requirements

Property	Test method (EN 438-2:2016, clause number)	Requirement
Thickness	5	0,5 ≤ *t* ≤ 1,0 mm : ± 0,10 mm maximum variation 1,0 < *t* < 2,0 mm: ± 0,15 mm maximum variation
Length and width [b]	6	+ 10 mm/ − 0 mm
Edges straightness [b]	7	1,5 mm/m maximum deviation
Edges squareness [b]	8	1,5 mm/m maximum deviation
Flatness [a]	9	60 mm/m maximum deviation
[a] Provided that the laminates are stored in the manner and conditions recommended by the manufacturer they shall comply with the flatness requirements specified in Table 4 when measured in accordance with EN 438-2:2016, Clause 9. [b] Tolerances for cut-to-size panels shall be agreed between supplier and purchaser.		

5.4 Test requirements

5.4.1 General requirements

General requirements are specified in Table 3.

Table 3 — General requirements

Property	Test method (EN 438-2:2016, clause number unless otherwise stated)	Property or attribute	Unit (max. or min.)	Level of use according to EN ISO 10874					
				21	22	23/31	32	33	34
Abrasion class Resistance to abrasion	11	Abrasion resistance initial point (IP)	 Revolutions (min)	AC1 900	AC2 1500	AC3 2000	AC4 4000	AC5 6000	AC6 8500
Resistance to water vapour	14	Appearance	Rating (min)	4	4	4	4	4	4
Dimensional stability at elevated temperature	17	Cumulative dimension change	% (max) t < 1 mm L [d] T [e] 1 ≤ t < 2 mm L T	 0,65 1,15 0,45 0,90	 0,65 1,15 0,45 0,90	 0,65 1,15 0,45 0,90	 0,65 1,15 0,45 0,90	 0,65 1,15 0,45 0,90	 0,65 1,15 0,45 0,90
Impact resistance [a] By small diameter ball By large diameter ball	20 [b] 21	Spring force Drop height Indentation diameter	 N (min) mm (min) mm (max)	 20 1600 10	 20 1600 10	 20 1600 10	 20 1600 10	 20 1600 10	 20[c] 1600[c] 10[c]
Resistance to staining	26	Appearance	Rating (min) groups 1 & 2 group 3	 5 4	 5 4	 5 4	 5 4	 5 4	 5 5
Light fastness (xenon arc)	27	Contrast	Grey scale rating	4 to 5	4 to 5	4 to 5	4 to 5	4 to 5	4 to 5
Resistance to wet heat (100 °C)	EN 12721	Appearance	Rating (min)	4	4	4	4	4	4
Density	EN ISO 1183-1	Density	g/cm³ (min)	1,35	1,35	1,35	1,35	1,35	1,35

[a] These requirements equate to Impact Class IC3 in EN 13329.

[b] The test is carried out with the laminate bonded to 6 mm ± 0,3 mm thick dry process fibreboard (MDF) of density (850 ± 50) kg/m³ as defined in EN 316, using PVAc adhesive.

[c] The requirement for class "34" is Impact Class IC4: ≥ 1600 mm drop height and ≥ 20 N spring force

[d] L: in the longitudinal (or machine) direction of the fibrous sheet material (normally the direction of the longest Dimension of the laminate).

[e] T: in the cross — longitudinal (cross — machine) direction of the fibrous sheet material (at right angles to direction L).

5.4.2 Notes on requirements for reaction to fire

The requirements for reaction to fire are determined by the fire regulations of the country in which the material is to be used.

In Europe, laminate panels intended for construction applications are tested in accordance with EN ISO 9239-1 and EN ISO 11925-2, and the resulting reaction-to-fire performance is expressed in accordance with EN 13501-1.

For applications other than construction, fire test methods and performance requirements may vary from one country to another, and at present it is not possible, with any test, to predict compliance with all national and other requirements.

All the products covered by this part of EN 438 will have different reaction to fire performance depending on the composition and/or decorative surfaces. Reaction to fire will also depend on laminate thickness and construction of the element, substrate type and thickness, and adhesive used. The laminate manufacturer should be contacted for information on fire test methods, classifications and fire certification.

No fire performance test is therefore included in this part of EN 438.

5.5 Supplemental properties

For certain applications, information on some of the properties listed in Table 4 may be required. On request, this information shall be supplied by the laminate manufacturer and in this case shall have been derived using the test methods listed in Table 4.

Table 4 — Supplemental properties and test methods

Property	Test method
Electrostatic properties: - point to point resistance - vertical resistance	 EN 61340-4-1 EN 61340-4-1
Microscratch resistance	EN 16094

NOTE For certain applications, information on additional properties not specified in Table 4 may be required.

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