BS EN 15534-4:2014

BSI Standards Publication

Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC))

Part 4: Specifications for decking profiles and tiles

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National foreword

This British Standard is the UK implementation of EN 15534-4:2014. Together with BS EN 15534-5:2014 it supersedes DD CEN/TS 15534-3:2007, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/42, Fibre reinforced thermosetting plastics and prepregs.

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

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English Version

Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) - Part 4: Specifications for decking profiles and tiles

Composites à base de matières cellulosiques et de thermoplastiques (communément appelés composites bois-polymères (WPC) ou composites fibres d'origine naturelle (NFC)) - Partie 4: Spécifications relatives aux lames et dalles pour platelage

Verbundwerkstoffe aus cellulosehaltigen Materialien und Thermoplasten (üblicherweise Holz-Polymer-Werkstoffe (WPC) oder Naturfaserverbundwerkstoffe (NFC) genannt) - Teil 4: Anforderungen an Profile und Formteile für Bodenbeläge

This European Standard was approved by CEN on 9 November 2013.

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Contents

Page

Foreword

This document (EN 15534-4:2014) 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of an identical text or by endorsement, at the latest by July 2014, and conflicting national standards shall be withdrawn at the latest by July 2014.

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 together with EN 15534-5:2014 supersedes CEN/TS 15534-3:2007.

The significant changes that have been made since the previous edition are the following:

— splitting into Parts 4 and 5 of CEN/TS 15534-3:2007;

— change of the status from Technical Specification to European Standard;

— complete technical review of the document;

— change of the Scope from characterization to specification of the products.

EN 15534 consists of the following parts:

— EN 15534-1, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) — Part 1: Test methods for characterization of compounds and products*

— prEN 15534-2, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) — Part 2: Characterization of compounds*[1)]

— EN 15534-4, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) — Part 4: Specifications for decking profiles and tiles*

— EN 15534-5, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) — Part 5: Specifications for cladding profiles and tiles*

— prEN 15534-6, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) — Part 6: Specifications for fencing profiles and systems*[1)]

— prEN 15534-7, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) — Part 7: Specifications for general purpose profiles in external applications*[1)]

1) In preparation.

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1 Scope

This European Standard specifies the characteristics of decking profiles and tiles made from cellulose-based materials and thermoplastics, usually called wood-polymer composites (WPC) or natural fibre composites (NFC), for external use.

This part of EN 15534 is applicable to extruded profiles but also to tiles manufactured by other plastics processing techniques, e.g. injection moulding.

It is not applicable to kits (i.e. support rail profiles, cover strip profiles and hardware) which are out of the scope of this part of EN 15534.

EN 15534-1 specifies the test methods relevant to this part of EN 15534.

NOTE For editorial reasons, in EN 15534 the abbreviation “WPC” is used for “composites made from cellulose-based materials and thermoplastics”.

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 927-6, *Paints and varnishes — Coating materials and coating systems for exterior wood — Part 6: Exposure of wood coatings to artificial weathering using fluorescent UV lamps and water*

EN 15534-1:2014, *Composites made from cellulose-based materials and thermoplastics (usually called wood-polymer composites (WPC) or natural fibre composites (NFC)) — Part 1: Test methods for characterisation of compounds and products*

EN 16472, *Plastics — Method for artificial accelerated photoageing using medium pressure mercury vapour lamps*

EN ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps (ISO 4892-2)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15534-1:2014 apply.

4 Requirements

4.1 General

Initial type testing shall be performed to demonstrate compliance with the requirements specified in Clause 4 of this part of EN 15534. The tests according to 4.5.7 shall be carried out if the performance is declared by the manufacturer. Initial type testing shall be repeated, whenever a change occurs in the composition of the product, its geometry or in the production process. In case of a minor change, only the properties which could be influenced by this change shall be tested.

NOTE Minimum frequencies of testing for factory production control purposes are given in Annex A.

4.2 Material

The base polymer, from which the material is produced, and the type and content of cellulose-based material shall be declared by the manufacturer.

Reprocessable and/or recyclable materials may be used for manufacturing profiles and tiles provided that they satisfy to the provisions of this part of EN 15534.

WPC materials are recyclable materials which can be treated in a material recovery process intended to save resources while minimizing harmful emissions into air, water and soil as well as their impacts on human health.

NOTE A scheme for the characterization of plastics waste is given in EN 15347 [2] and guidelines for the recovery and recycling are given in ISO 15270 [3].

4.3 Appearance

For production control purposes, the manufacturer shall compare three samples drawn at random from the same profile/tile production batch with a control sample, under the illumination conditions defined in EN 15534-1:2014, 6.1.

The control samples shall be stored in a dark room and renewed every six months.

If a control sample is put in contact with water, it shall be renewed immediately.

4.4 Physical characteristics

When tested in accordance with the test methods as specified in Table 1, using the parameters indicated, the profiles/tiles, as delivered to the customer, shall have characteristics conforming to the requirements given in Table 1.

Table 1 — Physical characteristics

Characteristic	Requirements	Test method	Number of test specimens
Slipperiness [a]			
a) Pendulum test	Pendulum value ≥ 36	EN 15534–1:2014, 6.4.2	5 specimens/face/direction [b]
OR			
b) Inclination plan test	Class C (≥24°)	EN 15534–1:2014, 6.4.3	1 specimen/face/direction [b]
OR			
c) Dynamic coefficient of friction (dry condition)	≥ 0,43	EN 15534–1:2014, 6.4.4	1 specimen/face/direction [b]
Linear mass (applicable to profiles)	Individual values ≥ 95 % declared value by the manufacturer. The linear mass and tolerances shall be declared by the manufacturer.	EN 15534–1:2014, 6.5	3 specimens
Thickness, width and length (applicable to profiles)	The relevant dimensional values and their tolerances shall be declared by the manufacturer.	EN 15534–1:2014, 6.6.2	3 specimens
Deviation from straightness (applicable to profiles)	The deviation of straightness and its tolerance shall be declared by the manufacturer.	EN 15534–1:2014, 6.6.3	3 specimens
Cupping	The cupping value and its tolerance shall be declared by the manufacturer.	EN 15534–1:2014, 6.6.4	3 specimens

[a] The choice of the method for assessing the slipperiness is under the responsibility of the manufacturer taking into account the relevant national regulations according to the field of use of the profiles/tiles, if existing. The method used for assessing the slipperiness shall be declared by the manufacturer.

[b] In both directions and on both faces of the profile/tile, if relevant.

4.5 Mechanical characteristics

4.5.1 Falling mass impact resistance

When tested in accordance with the test methods as specified in Table 2, using the parameters indicated, the profiles/tiles, as delivered to the customer, shall have characteristic conforming to the requirements given in Table 2.

Table 2 — Falling mass impact resistance

Requirements	Test parameters	Test method	Number of test specimens
Hollow profiles			
None of 10 test specimens shall show a failure with a crack length ≥ 10 mm or a depth of residual indentation ≥ 0,5 mm. In case of one failure, 10 additional test specimens shall be tested and no failure with a crack length ≥ 10 mm or a depth of residual indentation ≥ 0,5 mm shall occur.	H: (700 ± 5) mm M_s: (1 000 ± 5) g	EN 15534–1:2014, 7.1.2.1	10 specimens/face[a]
Solid profiles			
None of 10 test specimens shall show a failure with a depth of residual indentation ≥ 0,5 mm. In case of one failure, 10 additional test specimens shall be tested and no failure with a depth of residual indentation ≥ 0,5 mm shall occur.	H: (700 ± 5) mm M_s: (1 000 ± 5) g	EN 15534–1:2014, 7.1.2.1	10 specimens/face[a]
[a] On both faces of the profile/tile, if relevant.			

4.5.2 Flexural properties

When tested in accordance with the test methods as specified in Table 3, using the parameters indicated, the profiles/tiles, as delivered to the customer, shall have characteristics conforming to the requirements given in Table 3.

Table 3 — Flexural properties

Requirements	Test parameters	Test method	Number of test specimens
- F'_{max} ≥ 3 300 N (arithmetic mean value) - F'_{max} ≥ 3 000 N (individual values)	Span in use declared by the manufacturer	EN 15534–1:2014, Annex A	8 specimens /face[a]
- Deflection under a load of 500 N ≤ 2,0 mm (arithmetic mean value) - Deflection under a load of 500 N ≤ 2,5 mm (individual values)			
[a] On both faces of the profile/tile, if relevant.			

The conformity to the requirements given in Table 3 may be verified by calculation using the modulus of elasticity in bending and the bending strength of the profile. The value to be considered for these calculation shall be 5th percentile value.

4.5.3 Creep behaviour

When tested in accordance with the test methods as specified in Table 4, using the parameters indicated, the profiles/tiles, as delivered to the customer, shall have characteristics conforming to the requirements given in Table 4.

Table 4 — Creep behaviour

Requirements	Test parameters	Test method	Number of test specimens
Known span in use			
Δ_S ≤ 10 mm for arithmetic mean value Δ_S ≤ 13 mm for individual values Δ_{Sr} ≤ 5 mm for arithmetic mean value	Span in use declared by the manufacturer	EN 15534–1:2014, 7.4.1	3 specimens mounted to the test apparatus in the same way as for the bending test according to 4.5.2 giving the lower mean value for the maximum force [a]
Unknown span in use			
C_f ≤ 6 and CV (coefficient of variation) ≤ 15 % E_{rc} ≥ 30 % and CV (coefficient of variation) ≤ 15 %	-	EN 15534–1:2014, 7.4.2	3 specimens mounted to the test apparatus in the same way as for the bending test according to 4.5.2 giving the lower mean value for the maximum force [a]
[a] On both faces of the profile/tile, if relevant.			

4.5.4 Durability of products against biological agents

For the purpose of this part of EN 15534, use classes according to the environmental conditions are defined in Table 5.

Table 5 — Use class and occurrence of biological agents

Use class [a]	Service situation	Biological agents
3	External use, above ground	Basidiomycetes
4	External use, in ground contact	Soft rotting micro-fungi
NOTE Use classes 3 and 4 are derived from EN 335:2013, Table 1.		
[a] A product may be classified in use class 3 or 4 or both.		

If products of different geometries are made from the same material, only one product shall be tested.

When tested in accordance with the test methods as specified in Table 6, using the parameters indicated, the products shall have characteristics conforming to the requirements given in Table 6.

Table 6 — Resistance against biological agents

Characteristics	Requirements	Test method	Number of test specimens
Resistance against basidiomycetes	The test result shall be declared	EN 15534–1:2014, 8.5.2	See EN 15534–1:2014, Table 2
Resistance against soft rotting micro-fungi	The test result shall be declared	EN 15534–1:2014, 8.5.3	See EN 15534–1:2014, Table 3
NOTE At the date of publication of this part of EN 15534, there is a lack of experience to specify requirements for these properties.			

4.5.5 Durability of the products against ageing and moisture

When tested in accordance with the test methods as specified in Table 7, using the parameters indicated, the products, as delivered to the customer, shall have characteristics conforming to the requirements given in Table 7.

Table 7 — Durability of the products against ageing and moisture

Properties	Requirements	Test parameters	Test method	Number of test specimens
Resistance to artificial weathering	- ΔL^*, Δa^*, Δb^* shall be declared	300 h EN ISO 4892-2 2016 h EN 927–6 750 h EN 16472	EN 15534–1:2014, 8.1	1 specimen/colour (5 measurements /specimen)
Depending on the test method, the same material can lead to different ΔL, Δa, Δb values				
Moisture resistance under cyclic test conditions	- Mean of decrease of bending strength ≤ 20 % - Individual decrease of bending strength ≤ 30 %	-	EN 15534–1:2014, 8.3.2 and 7.3.2	8 specimens mounted to the test apparatus in the same way as for the bending test according to 4.5.2 giving the lower mean value for the maximum force [a]
Swelling and water absorption (use class 3 or 4)	1) Means welling: ≤ 4 % in thickness ≤ 0,8 % in width ≤ 0,4 % in length 2) Individual swelling: ≤ 5 % in thickness ≤ 1,2 % in width ≤ 0,6 % in length 3) Mean water absorption ≤ 7 % in weight 4) Individual water absorption ≤ 9 % in weight	-	EN 15534–1:2014, 8.3.1	5 specimens
Boiling test (for production control purpose only)	1) Mean value of water absorption ≤ 7 % in weight 2) Individual values of water absorption ≤ 9 % in weight	-	EN 15534–1:2014, 8.3.3	5 specimens
[a] On both faces of the profile/tile, if relevant.				

4.5.6 Thermal properties

When tested in accordance with the test methods as specified in Table 8, the materials shall have characteristics conforming to the requirements given in Table 8.

Table 8 — Thermal properties

Properties	Requirement	Test method	Number of test specimens
Linear thermal expansion coefficient	≤ $50 \cdot 10^{-6}$ K^{-1}	EN 15534–1:2014, 9.2	3 specimens

4.5.7 Additional characteristics

Additional characteristic(s) to those given in Tables 1 to 8, listed in Table 9 and 10, shall be assessed when required by the customer, a third party or to comply with regulations. The corresponding test result(s) and performance(s), as applicable, shall be declared by the manufacturer.

NOTE Minimum frequencies of testing for factory production control purposes are given in Annex A.

Table 9 — Resistance to natural ageing

Property	Requirements	Test parameters	Test method	Number of test specimens
Resistance to natural ageing	- The decrease of bending strength shall be declared. - *ΔL**, *Δa**, *Δb** *ΔE** or gray scale rating shall be declared. - The change of the modulus of elasticity in bending shall be declared. - The appearance criteria, as defined by the manufacturer. - The location of exposure and conditions shall be declared.	Exposure duration: 8 760 h	EN 15534–1:2014, 8.2	1 specimen/colour (5 measurements /specimen) mounted to the test apparatus in the same way as for the bending test according to 4.5.2 giving the lower mean value for the maximum force

Table 10 — Additional characteristics

Properties	Test method	Number of test specimens
Thermal properties		
Heat reversion (applicable to profiles)	EN 15534–1:2014, 9.3	3 specimens
Heat build-up	EN 15534–1:2014, 9.4	3 specimens
Reaction to fire - Single flame source test	EN 15534–1:2014, 9.6.1	6 specimens
Spread of flame - Radiant heat source	EN 15534–1:2014, 9.6.3	6 specimens
Mechanical characteristics		
Modulus of elasticity in bending	EN 15534–1:2014, 7.3.2	8 specimens/face [a]
Bending strength	EN 15534–1:2014, 7.3.2	8 specimens/face [a]
Resistance to indentation	EN 15534–1:2014, 7.5	3 specimens
Resistance against biological agents		
Resistance against termites[b]	EN 15534–1:2014, 8.4	5 specimens
Resistance against discolouring micro-fungi [b]	EN 15534–1:2014, 8.5.4 and 8.5.5	5 specimens
Resistance against discolouring algae [b]	EN 15534–1:2014, 8.5.6	5 specimens
Other properties		
Resistance to salt spray (NSS test)	EN 15534–1:2014, 8.6	2 specimens
Degree of chalking (for coated products, only)	EN 15534–1:2014, 10.1	3 specimens

[a] On both faces of the profile/tile, if relevant.

[b] If products of different geometries are made from the same material, only one product shall be tested.

5 Marking

The minimum required marking as defined in Table 11, shall be marked on the product or to a label attached to it. Where this is not possible, it shall be affixed to the packaging.

Table 11 — Minimum required marking

Aspects	Mark or symbol
Reference of this part of EN 15534	EN 15534–4
Base polymer	e.g. PP
Type of cellulose-based material [a]	e.g. W
Average content of cellulose-based material (%)	e.g. 60
Use class[b] according to the environmental conditions	e.g. UC3
[a] See Table 12.	
[b] See Table 5.	

Table 12 — Code for cellulose-based material

Cellulose-based material	Symbol
Wood	W
Flax	F
Hemp	H
Rice	R
Bamboo	B
Paper	P
Sisal	S
Coconut	C
Other	O

EXAMPLES EN 15534–4 PP W60 UC3

EN 15534–4 PVC-U H50 UC3

Annex A
(informative)

Minimum frequencies of testing for factory production control purposes

Table A.1 — Minimum frequency of testing for factory production control purposes

Characteristic	Minimum frequency of testing
Linear mass	1 specimen/production line ≤ 12 h
Thickness, width, length	1 specimen/production line ≤ 12 h
Straightness, cupping	1 specimen/production line ≤ 12 h
Appearance	1 specimen/production line ≤ 12 h
Flexural properties (modulus of elasticity in bending and bending strength)	1 specimen/ production line ≤ 12 h mounted to the test apparatus in the same way as for the bending test according to 4.5.2 giving the lower mean value for the maximum force [a]
Moisture resistance – Boiling test	1 specimen/production line ≤ 12 h
Heat reversion (applicable to profiles)	3 specimens/ production line ≤ 12 h
[a] On both faces of the profile/tile, if relevant.	

Bibliography

[1] EN 335:2013, *Durability of wood and wood-based products — Use classes: definitions, application to solid wood and wood-based products*

[2] EN 15347, *Plastics - Recycled Plastics — Characterisation of plastics wastes*

[3] ISO 15270, *Plastics — Guidelines for the recovery and recycling of plastics waste*

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