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Plastics — Wood-plastic recycled composites (WPRC) —

Part 2: Test methods

Plastiques — Composites recyclés bois-plastique (WPRC) —

Partie 2: Méthodes d'essai

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC61, *Plastics*, Subcommittee SC11, *Products*.

A list of all parts in the ISO 20819 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Wood-plastic composites (WPC) are composites of natural fibres such as wood and various plastics. ISO 16616 has been established as the ISO for such products. WPC is commonly used for exterior materials such as wood decks and louvers, and interior materials such as doors and flooring.

To protect the global environment, it is required to promote the recycling of plastics. WPCs that use such recycled plastics are called wood-plastic recycled composites (WPRC). The quality of recycled plastics such as WPRC is lower than that of virgin plastics, and there are concerns about the inclusion of harmful substances, which may make consumers hesitant when choosing WPRC using recycled plastics. On the other hand, it is also necessary to provide appropriate information to consumers who want to purchase environmental-friendly products with a higher recycling rate.

ISO 20819-1 is a calculation method of recycling ratio, labelling, and safety test. Safety testing for hazardous substances is necessary to dispel consumer concerns about contamination with hazardous substances when using recycled materials. ISO 20819-2 provides a test method for product durability that is expected when recycled plastic is used. There has never been an ISO standard that specializes in using recycled plastics in this way. It also stipulates test methods for cellular products not mentioned in ISO 16616.

This document has been established so that consumers' anxiety can be reduced by conducting the tests specified in this document, and environmental-friendly and safe products using recycled plastic can be selected.

Plastics — Wood-plastic recycled composites (WPRC) —

Part 2:
Test methods

1 Scope

This document defines the test methods for fundamental physical properties and durability required for wood-plastic recycled composites (hereinafter called WPRC) stipulated in ISO 20819-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 75-2, *Plastics — Determination of temperature of deflection under load — Part 2: Plastics and ebonite*

ISO 178, *Plastics — Determination of flexural properties*

ISO 179-1, *Plastics — Determination of Charpy impact properties — Part 1: Non-instrumented impact test*

ISO 472, *Plastics — Vocabulary*

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

ISO 16616:2015, *Test methods for natural fibre-reinforced plastic composite (NFC) deck boards*

ISO 20819-1:2020, *Plastics — Wood-plastic recycled composites (WPRC) — Part 1: Specification*

EN 15534-1, *Composites made from cellulose-based materials and thermoplastics(usually called wood-polymer composites(WPC) or natural fibre composites(NFC))-Part1:Test methods for characterisation of compounds and products*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
wood-plastic recycled composites
WPRC
mixture of woody material/natural fibre and thermoplastics, composited by means of plastic moulding and containing recycled material as raw material forming at least 40 % of the total.

[SOURCE: ISO20819-1:2020, 3.1]

3.2
non-foaming material
wood-plastic recycled composites that do not contain internal air voids.

Note 1 to entry: Non-foaming materials include solid products, hollow products, and products with multilayer formation consisting of different constituents inside and outside.

[SOURCE: ISO20819-1:2020, 3.6 — Note 1 to entry has been added.]

3.3
cellular material
wood-plastic recycled composites containing internal air voids scattered primarily for the purpose of weight reduction.

Note 1 to entry: Cellular material can include material integrated with a non-foaming material using methods such as multilayer moulding.

[SOURCE: ISO20819-1:2020, 3.7]

4 Quality

4.1 Appearance

The appearance of WPRC shall conform with the requirements in Table 1.

Table 1 — Appearance

Defect types	Judgment
Dirtiness and flaws [a]	Should be free from remarkably conspicuous defects. [c]
Warps and twists	Should be free from remarkably conspicuous defects. [c]
Mixture of foreign matter [b]	Should be free from remarkably conspicuous defects. [c]
Chipping, cracks, breakage, and through-cracks	Should not be allowed.

[a] Influences of raw materials are not included.

[b] Foreign matter shall mean substances other than raw materials.

[c] Subject to consultation between the partners.

4.2 Basic physical properties and durability

When the basic physical properties and durability tests of WPRC are conducted according to 5.3, the performance of the basic physical properties for non-foaming material and cellular material shall be in accordance with Table 2 and Table 3. Durability performance should be in accordance with the consultation between partners.

Note Guide for standard of performance value is described in Annex A.

Table 2 — Material performance of basic properties

Performance item		Test methods				Unit	Performance value
		Test clause	Non-foaming materials	Cellular materials	Measurement		
Density		5.3 a)	Method A	—	—	g/cm^3	[a]
			Method B		—		[a]
Water absorption properties	Water absorption	5.3 b)	Method A		—	%	[a]
	Length change rate	5.3 b)	Method A		—	%	[a]
Strength	Flexural properties	5.3 c)	Method A	—	Flexural stress with cut-out test specimens	MPa	[a]
			Method B		Flexural stress with actual size test specimens	MPa	[a]
	Impact resistance	5.3 d)	Method A	—	Impact strength with cut-out test specimens	kJ/m^2	[a]
			Method B		Impact resistance with actual size test specimens	—	[a]
			Method C		Impact resistance with actual size test specimens	—	[a]
Thermal properties		5.3 e)	Method A	—	Temperature of deflection under load	°C	[a]
			Method B[b]		Residual ratio of thermal flexural stress	%	[a]

[a] Subject to the standard of each country.

[b] Excluding non-foaming hollow products.

Table 3 — Material performance of durability

Performance item		Test methods				Unit	Performance value
		Test clause	Non-foaming materials	Cellular materials	Measurement		
Weather-ability	Flexural properties after weathering test	5.3 f)	Method A	—	Change rate of flexural stress after weathering test	%	[a]
			Method B [c]		Change rate of flexural stress after weathering test	%	[a]
Heat aging resistance	Flexural properties after heat aging tests	5.3 g)	Method A	—	Change rate of flexural stress after heat aging test	%	[a]
			Method B		Change rate of flexural stress after heat aging test	%	[a]
	Impact resistance after heat aging test	5.3 h)	Method A	—	Change rate of impact strength after heat aging test	%	[a]
			Method B		Impact resistance with actual size test specimens after heat aging test	—	[a]
			Method C		Impact resistance with actual size test specimens after heat aging test	—	[a]
Thermal shock resistance	Flexural properties after thermal cycling test	5.3 i)	Method A	—	Change rate of flexural stress after thermal cycling test	%	[a]
			Method B		Change rate of flexural stress after thermal cycling test	%	[a]
	Impact resistance after thermal cycling test	5.3 j)	Method A	—	Change rate of impact strength after thermal cycling test	%	[a]
			Method B		Impact resistance with actual size test specimens after thermal cycling test	—	[a]
			Method C		Impact resistance with actual size test specimens after thermal cycling test	—	[a]

[a] Subject to consultation between partners.

5 Test method

5.1 Sampling of test specimens

The collection method, dimensions, and number of test specimens for non-foaming material and cellular material are shown in Table 4 and Table 5.

Test specimens for hollow products with non-foaming material shall be collected from the surface of hollow products, except for test items of the water absorption property and actual size test specimens. Test specimens for cellular material shall not be collected from the vicinity of both ends of the product in the width direction.

Table 4 — Collection method, dimensions, and number of test specimens of basic physical properties

Performance item		Test methods			Test specimens collection method	Dimensions of test specimens	Number of test specimens
		Test clause	Non-foaming materials	Cellular materials			
Density		5.3 a)	Method A	—	s	*l* : 20 mm *w* : 20 mm *t* : 5 mm or more	3
			Method B		p	*l* : 20 mm *w*: Product width or 150 mm *t* : Product thickness	3
Water absorption properties	Water absorption	5.3 b)	Method A		p	*l* : 100 mm *w* : Product width *t* : Product thickness	3
	Length change rate	5.3 b)	Method A		p	*l* : 100 mm *w* : Product width *t* : Product thickness	3
Strength	Flexural properties	5.3 c)	Method A	—	s-1	*l* : 80 mm *w* : 10 mm *t* : 4 mm	3
			Method B		p	*l* : Twenty times the thickness *w* : Product width *t* : Product thickness	3
	Impact resistance	5.3 d)	Method A	—	s-1	*l* : 80 mm *w* : 10 mm *t* : 4 mm	5
			Method B		p	*l* : The length of the support span in a real structure plus 100 mm *w* : Product width *t* : Product thickness	3
			Method C		p	*l* : More than the support span for the construction procedure specified by the manufacturer *w* : Product width *t* : Product thickness	3

s : Collection from the product surface

s-1 : Collection from the product surface, and surface shall be smoothed. If the product is a two-layer moulding and the test specimen is thicker than the thickness required for the test, it shall be shaved to the same thickness as its layer thickness ratio.

p : Collection from the product

l : Length

w : Width

t : Thickness