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Plastics — Wood-plastic recycled composites (WPRC) —

Part 1: Specification

Plastiques — Composites recyclés bois-plastique (WPRC) — Partie 1: Spécifications

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Foreword

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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 on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, SC 11, *Products*.

This first edition of ISO 20819-1 cancels and replaces ISO 20819:2018, which has been technically revised.

The main changes compared to the previous edition are as follows:

— the condition of method B (emission test chamber method) has been described more precisely;

— the former Annex A has been divided to Annexes A and B.

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.

Plastics — Wood-plastic recycled composites (WPRC) —

Part 1: Specification

1 Scope

This document specifies the types and proportions of raw materials to be used for wood-plastic recycled composites (hereafter referred to as WPRC). It also specifies the health and safety requirements for WPRC and the methods to test these properties.

This document is applicable to WPRC which are primarily used as building materials.

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 472, *Plastics — Vocabulary*

ISO 12460-4, *Wood-based panels — Determination of formaldehyde release — Part 4: Desiccator method*

ISO 12846, *Water quality — Determination of mercury — Method using atomic absorption spectrometry (AAS) with and without enrichment*

ISO 13061-1, *Physical and mechanical properties of wood — Test methods for small clear wood specimens — Part 1: Determination of moisture content for physical and mechanical tests*

ISO 16000-3, *Indoor air — Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air — Active sampling method*

ISO 16000-9, *Indoor air — Part 9: Determination of the emission of volatile organic compounds from building products and furnishing — Emission test chamber method*

ISO 17294-2, *Water quality — Application of inductively coupled plasma mass spectrometry (ICP-MS) — Part 2: Determination of selected elements including uranium isotopes*

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 http://www.electropedia.org/

3.1
wood-plastic recycled composite
WPRC
mixture of woody material/natural fibre and thermoplastics, composited by means of plastic moulding and containing *recycled material* (3.2) as raw material forming at least 40 % of the total composite mass

3.2
recycled material
woody raw material (3.4), recycled plastic raw material, or other recyclable material that is disposed of as waste, which can be used as a raw material of *wood-plastic recycled composite* (3.1)

Note 1 to entry: Different national standards regarding raw material of recycled plastics which consist of halogenated flame retardant should be taken into account.

3.3
virgin material
plastics and other material in the form of pellets, granules, powder, floc, etc., that has not been subjected to use or processing other than that required for its initial manufacture

3.4
woody raw material
plant-derived virgin woody or herb-based material, or plant-derived secondary product to which some processing such as selection, crushing, or grinding has been applied, or woody material included in a WPRC for re-use, that is used as a raw material of *wood-plastic recycled composite* (3.1)

Note 1 to entry: Woody raw material does not include plant-derived plastic materials nor ashes of burned plant-derived materials.

3.5
other raw material
raw material used in *wood-plastic recycled composite* (3.1) other than *woody raw material* (3.4) and plastic raw material

3.6
non-foaming material
wood-plastic recycled composite (3.1) that does not contain internal air voids

3.7
cellular material
wood-plastic recycled composite (3.1) 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.

4 Recycled material content

4.1 Indication of the recycled material content

The recycled material content of WPRC is defined as the ratio of the mass of the recycled materials used to the total mass of material, and shall be indicated as a percentage.

The numerical value of the recycled material content shall be rounded off to the nearest integer.

4.2 Classification of the recycled material content

The classification of recycled material content of WPRC and symbols used to indicate the classification shall be as listed in Table 1.

Table 1 — Classification and symbols of recycled material content

Content classification	Symbol
≥ 40 %	R40
≥ 50 %	R50

Table 1 *(continued)*

Content classification	Symbol
≥ 60 %	R60
≥ 70 %	R70
≥ 80 %	R80
≥ 90 %	R90

Use of the symbol for recycled material content of WPRC indicates that the product thus classified contributes to waste reduction, or is an environmentally friendly product/material promoting sound foresting and forest sink measures as well as environmental/land conservation.

4.3 Formulae for calculating the recycled material content, *R*

4.3.1 The recycled material content *R* of WPRC is calculated using mass values according to Formula (1):

$$R = \frac{m_{WR} + m_{PR} + m_{FR}}{m} \times 100 \quad (1)$$

where

R is the recycled material content, expressed as a percentage;

m_{WR} is the mass of recycled woody raw materials contained in the woody raw materials included in WPRC, expressed in kilograms;

m_{PR} is the mass of recycled thermoplastics raw materials contained in the thermoplastics raw materials included in WPRC, expressed in kilograms;

m_{FR} is the mass of recycled materials in the WPRC where woody raw materials and thermoplastics raw materials are excluded, expressed in kilograms;

m is the total mass of WPRC, expressed in kilograms.

Note in this context that:

$m = m_W + m_P + m_F$

$m_W = m_{WV} + m_{WR}$

$m_P = m_{PV} + m_{PR}$

$m_F = m_{FV} + m_{FR}$

where

m_W is the mass of woody raw materials contained in WPRC, expressed in kilograms;

m_{WV} is the mass of virgin woody raw materials contained in woody raw materials included in WPRC, expressed in kilograms;

m_P is the mass of thermoplastics raw materials contained in WPRC, expressed in kilograms;

m_{PV} is the mass of virgin thermoplastics raw materials contained in the thermoplastics raw materials included in WPRC, expressed in kilograms;

m_F is the mass of WPRC where woody raw materials and thermoplastics raw materials are excluded, expressed in kilograms;

m_{FV} is the mass of virgin materials in the WPRC where woody raw materials and thermoplastics raw materials are excluded, expressed in kilograms;

as shown in Table 2.

Table 2 — Components of total mass of WPRC

Total mass of WPRC m					
Woody raw material m_W		**Thermoplastics raw material** m_P		**Other raw material** m_F	
Virgin material m_{WV}	Recycled material m_{WR}	Virgin material m_{PV}	Recycled material m_{PR}	Virgin material m_{FV}	Recycled material m_{FR}

To calculate the total mass of WPRC (m), the values of m_W, m_{WV} and m_{WR} used shall be the values of the individual masses after drying as determined in accordance with ISO 13061-1. The moisture content determined shall be rounded to one decimal place.

4.3.2 Formula (2) is used to calculate the recycled material content of WPRC using mass fraction values, expressed as percentages of the recycled materials contained in each of the woody raw materials and plastic raw materials:

$$R = \frac{w_{WR} w_W}{100} + \frac{w_{PR} w_P}{100} + \frac{w_{FR} w_F}{100} \quad (2)$$

where

R is the recycled material content, expressed as a percentage;

w_W, w_P, w_F are the mass fractions, respectively, of woody raw materials, thermoplastics raw materials, and other raw materials contained in WPRC, expressed as percentages, where $w_W + w_p + w_F = 100$ %;

w_{WV}, w_{WR} are the mass fractions, respectively, of each of the virgin and recycled materials contained the in woody raw materials included in WPRC, expressed as percentages;

w_{PV}, w_{PR} are the mass fractions, respectively, of each of the virgin and recycled materials contained in plastic raw materials included in WPRC, expressed as percentages;

w_{FV}, w_{FR} are the mass fractions, respectively, of each of the virgin and recycled materials contained in raw materials (other than woody or plastic) included in WPRC, expressed as percentages.

Note in this context that:

$w_W + w_P + w_F = 100$ (% of WPRC);

$w_{WV} + w_{WR} = 100$ (% of woody raw materials);

$w_{PV} + w_{PR} = 100$ (% of plastic raw materials);

$w_{FV} + w_{FR} = 100$ (% of other raw materials);

as shown in Table 3.

Table 3 — Total mass fraction of WPRC

Total mass fraction of WPRC, where $w_W + w_P + w_F = 100$					
Woody raw material w_W		**Thermoplastics raw material** w_P		**Other raw material** w_F	
Virgin material w_{WV}	Recycled material w_{WR}	Virgin material w_{PV}	Recycled material w_{PR}	Virgin material w_{FV}	Recycled material w_{FR}

5 Raw materials

5.1 Traceability of raw materials

Raw materials for WPRC shall be verified to be virgin materials or recycled materials through documents or other forms certifying their quality when they are accepted.

5.2 Woody raw materials

Woody raw materials accepted as recycled materials shall be classified as construction-derived, industry-derived, forestry-derived, agriculture-derived, logistics-derived or other, as listed in Table A.1. Table A.2 lists for reference the sources of major items of woody raw materials accepted as recycled materials.

5.3 Plastic raw materials

Plastic raw materials shall be thermoplastics raw materials as listed in Table B. The symbols and abbreviated terms used are given in ISO 1043-1. In addition to those listed in Table B, plastics obtained as waste can also be used as components of WPRC.

5.4 Other raw materials

Other raw materials refer to additives such as lubricants, stabilizers, compatibilisers, pigments and plasticisers.

6 Raw material proportions

6.1 Proportion (mass fraction) of woody raw materials

The proportion of woody raw materials contained in WPRC [w_W (%)] shall be the ratio of the mass of the woody raw materials (m_W) to the total mass of WPRC (m), expressed as a percentage; it is calculated according to Formula (3):

$$w_W = \frac{m_W}{m} \times 100 \quad (3)$$

6.2 Proportion (mass fraction) of plastic raw materials

The proportion of plastic raw materials contained in WPRC [w_P (%)] shall be the ratio of the mass of the plastic raw materials (m_P) to the total mass of WPRC (m), expressed as a percentage; it is calculated according to Formula (4):

$$w_P = \frac{m_P}{m} \times 100 \quad (4)$$

7 Classification

Types of WPRC shall be classified as per Tables 4 and 5, according to moulding method and major use.

Table 4 — Classification by moulding method

Classification	Classification Symbol	Description
Non-foaming material	S	WPRC that does not contain internal air voids
Cellular material	F	WPRC containing internal air voids scattered primarily for the purpose of weight reduction, including material integrated with a non-foaming material using methods such as multilayer moulding.

Table 5 — Classification by major use

Use area	Use area symbol	Major use	Major use symbol	Description
Exterior	EX	— Deck materials, floorboard materials, bench materials — Louvre materials, fencing materials, gate materials, balcony materials, terrace materials, pergola materials — Forms	1	Used in outdoor areas considered to be exposed to relatively large external forces, e.g. people walking
		— Fixture materials, facing materials	2	Used in outdoor areas assumed not to be exposed to external forces, e.g. people walking
Interior	IN	— Flooring materials	1	Used in indoor areas considered to be exposed to relatively large external forces, e.g. people walking.
		— Fixture materials, facing materials	2	Used in indoor areas assumed not to be exposed to external forces, e.g. people walking.

8 Health and safety requirements for materials

The health and safety aspects of WPRC shall conform to Table 6 when tested according to 9.2.