ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A1*

Owner of the Declaration	Verband der Deutschen Holzwerkstoffindustrie e.V. (VHI)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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WPC cladding profiles

Verband der Deutschen Holzwerkstoffindustrie e.V. (VHI)

Association of the German Wood-based Panel Industry

NOVO-TECH

Überreicht durch das VHI-Mitgliedsunternehmen
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VHI VERBAND DER DEUTSCHEN HOLZWERKSTOFFINDUSTRIE

General Information

Verband der Deutschen Holzwerkstoffindustrie e.V.

Programme holder
IBU – Institut Bauen und Umwelt e.V.
Panoramastr. 1
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Germany

Declaration number
EPD-VHI-20210248-IBE1-EN

This declaration is based on the product category rules:
Wood polymer composite facade elements, 07.2014
(PCR checked and approved by the SVR)

Issue date
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Valid to
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Dipl. Ing. Hans Peters
(chairman of Institut Bauen und Umwelt e.V.)

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(Managing Director Institut Bauen und Umwelt e.V.))

WPC cladding profiles

Owner of the declaration
Verband der Deutschen Holzwerkstoffindustrie e.V.
Schumannstraße 9
10117 Berlin

Declared product / declared unit
1 m² cladding profile made of WPC

Scope:
This declaration is an association EPD that represents an average product of the WPC manufacturing VHI member companies. The average is the weighted average of the manufacturer's data. The proportion of the production volume covered by the LCA is 84 % of the total production volume manufactured by all association members in the reference year 2021.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.
The EPD was created according to the specifications of *EN 15804+A1*. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard *EN 15804* serves as the core PCR
Independent verification of the declaration and data according to *ISO 14025:2010*
☐ internally ☒ externally

Matthias Klingler
(Independent verifier)

Product

Product description/Product definition
The declared product is a wood-polymer cladding profile specially suitable for outdoor use. The plastics matrix can consist either of polyethylene (PE), polypropylene (PP) or polyvinylchloride (PVC).

This EPD does not refer to a specific product of one manufacturer, but declares the average environmental quality for all WPC cladding profiles produced by member companies of the VHI. The information represents 100 % of the German market. Detailed data can be obtained from the product description of the manufacturer in question.

For the use and application of the product the respective national provisions at the place of use apply, in Germany for example the building codes of the federal states and the corresponding national specifications.

General regulations on WPC products can be found in the product standard /DIN EN 15234 Parts: 1, 4, 5/ as well as the quality and testing guidelines of the Qualitätsgemeinschaft Holzwerkstoffe e.V.. (www.qg-holzwerkstoffe.de/).

The legally binding version of these terms is the German EPD-document available on: www.ibu-epd.com | https://epd-online.com

Application
WPC cladding profiles are for cladding façades and can only be used as a non-load-bearing structural element (no construction engineering approval).
The products pose no risk to health and are technically safe.

Technical Data
The technical construction data listed in the following apply to all WPC cladding profiles made by the manufacturers involved.

Technical construction data

Name	Value	Unit
Density acc. EN ISO 1183-3	-	kg/m³
Density in accordance with EN ISO 1183-3/	1150 - 1260	kg/m³
Grammage	-	kg/m²
Grammage	7.5 - 17	kg/m²
Moisture content acc. ISO 16979	-	-
Moisture content in accordance with ISO 16979	0 - 1.5	M.-%
length density the profiles according to DIN EN 15534-1:2014	-	g/m
length density of the profiles in accordance with DIN EN 15534-1:2014	1520 - 2300	g/m
Dimensions (thickness, length and width of profiles due to DIN EN 15534-1:2014)	-	mm
Dimensions (thickness, length and width of the profiles in accordance with DIN EN 15534-1:2014)	2,5/82/1000-20/242/4000	mm
Deviation from straightness acc. DIN EN 15534-1	-	mm
Deviation from straightness in accordance with DIN EN 15534-1	1	mm
Curvature acc DIN EN 15534-1	-	mm
Curvature in accordance with DIN EN 15534-1	0.5	mm
Flexural properties acc. EN 310:1993 - tensile modulus	-	MPa
Flexural properties in accordance with EN 310:1993 - Elasticity modulus	-	MPa
Flexural properties acc. EN 310:1993 - flexural strength	-	MPa
Flexural properties in accordance with EN 310:1993 - Bending strength	-	MPa
Moisture resistance under cyclic conditions acc. EN 15534-1:2014	-	-
Moisture resistance under cyclical conditions in accordance with EN 15534-1:2014	-	-
Impact resistance acc. EN 477 - crack length	-	mm
Impact resistance in accordance with EN 477 - Crack length	No crack	mm
Impact resistance acc. EN 477 - depth of impression	-	mm
Impact resistance in accordance with EN 477 - Impression depth	<0,5	mm
Linear thermal expansion coefficient acc. ISO 11359-2	-	K^{-1}
Linear thermal expansion coefficient in accordance with ISO 11359-2	1.7E-05 - 2.8E-05	K^{-1}
Swelling acc. EN 317 - length-/ width- / thickness	-	%
Swelling in accordance with EN 317 (length, width, thickness)	0,2/0,7/0,4-0,3/0,94/4,16	%
Behavior in weathering tests acc. EN ISO 4892-2:2013	-	-
Behavior in weathering tests in accordance with EN ISO 4892-2:2013	-	-

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

Base materials/Ancillary materials

The average WPC cladding profile consists mainly of the following base materials:

Name	Value	Unit
Material	Description	Share in M-%
Wood fibres	Industrial waste wood of spruce and pine	63
Plastics matrix	Polyethylene (PE), Polypropylene (PP), Polyvinyl chloride (PVC)	29
Additives	Adehesives, internal lubricants, pigments, filling materials, dispersing agent	8

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The plastic or plastic compound integrated in the product must consist of 100 % new material, or of pure plastic which has accumulated as waste material once in the course of industrial production. Recycled material that is pure and free of harmful substances may also be used.
In addition, various additives are used in production. These are organic pigments and UV stabilisers, lubricants, adhesion promoters and dispersants. The additives used belong to the functional groups carboxylic acid anhydride, alkene, calcium stearate, zinc stearate, carbon and carboxylic acid ester.

The share of wood in the product must be at least 50 per cent by weight (dry), and must come from verifiably sustainable forestry (FSC or PEFC certificate). Natural waste wood (waste wood category AI in accordance with the Waste Wood Ordinance) may be used, but waste wood of the categories AII to AIV may not be used. Other natural fibres may be components of the product.

In order to save raw materials and to prevent emissions, ground material which comes from elements of the company's own system and which was taken back from the market may be added again.

The product contains substances on the ECHA list of substances of very high concern (SVHCs) which may be Substances of Very High Concern (en: Substances of Very High Concern (SVHC) (date 21.02.22) above 0.1 mass%: no.

The product contains other CMR substances of category 1A or 1B that are not on the candidate list, above above 0.1% by mass in at least one of the a sub-product: no.

The present construction product contains added biocidal products have been added or it has been treated with treated with biocidal products (it is therefore a treated product within the meaning of the Biocidal Products Regulation (EU) No 528/2012): no."

Reference service life
No reference service life is declared; according to manufacturers' specifications, a service life (SL) of 40 years can be expected for average use.
The technical service life of individual components is not exceeded here either, and so replacement does not need to be taken into account during the service life.

LCA: Calculation rules

Declared Unit
The declared unit is defined as follows:
1 m² of installed WPC cladding profiles, with the dimensions 1,000 - 4,000 mm/80 - 240 mm/18 - 25 mm and a surface weight of 7.79 kg/m², over a service life of 40 years.
The composition of the WPC cladding profiles results from the weighted average, depending on the production volume of the manufacturers involved.

Details on declared unit

Name	Value	Unit
Conversion factor to 1 kg	-	-
Conversion factor to 1 kg	0.1284	-
Declared unit	-	m^2
Declared unit	1	m^2
Density	-	kg/m^3
Density	1211	kg/m^3
Profile type	-	-
Profile type	54 % solid profile and 46 % hollow-chamber profile	-

The WPC products of the individual manufacturers have different proportions of wood and plastic. In order to determine the influence of the wood content, it was reduced to 50 % on the one hand and increased to 80 % on the other hand. The proportion of wood has a strong influence on the individual environmental impact categories.
In general, a higher proportion of wood fibre in the WPC product can reduce the environmental impact of a WPC cladding.
In contrast, if the proportion of additives is changed by +/- 20 %, the results of the impact assessment for the individual environmental impact categories vary only very slightly.

System boundary
Type of EPD: cradle-to-gate, with options
In accordance with EN 15804 the following modules are used:
Module A1-3
The aggregated representation in the form of A1-3 is used for production. This includes the supply of raw materials, the production of the WPC façade elements, all transportation to the manufacturer, the required energy consumption and resources, as well as all production waste that may accrue.
Module A4
Transportation of the product from the manufacturer to the construction site
Module B2
Maintenance of the WPC façade elements during the utilisation phase: cleaning of the WPC façade elements
Module C2
Transportation of the scrapped product to the recycling yard or to the manufacturer
Module C3
Waste treatment, such as thermal or material utilisation:
On account of the selected system boundaries (definition of the *end-of-waste* status), no disposal (Module C4) of the WPC façade elements takes place. This means that only the export of the properties inherent in the material is included in the balance.
Module D
Credits and debits outside the system under review, through thermal and material utilisation

Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

LCA: Scenarios and additional technical information

The following technical information forms the basis for the declared modules or can be used for developing specific scenarios within the context of a building appraisal if modules are not declared (MND).

Transport to construction site (A4)

Name	Value	Unit
Litres of fuel	142	l/100km

Litres of fuel	-	l/100km
Transport distance	500	km
Transport distance	-	km
Capacity utilisation (including empty runs)	85	%
Capacity utilisation (including empty runs)	-	%
Gross density of products transported	1211	kg/m³
Gross density of products transported	-	kg/m³
Capacity utilisation volume factor	-	-

Construction installation process (A5)
Composition of the packaging waste to be disposed of:

Name	Value	Unit
Squared timber	15	%
Polyethylene foil	55	%
Polyester strapping	2	%
Grey board	20	%
Hardboard	8	%

Maintenance (B2)

Name	Value	Unit
Information on maintenance Cleaning frequency in m²/a	0.0298	-
Water consumption	0.083	m³
Auxiliary material cleaning agent	0.01	kg
Maintenance cycle in m²/SL	1,192	Number/SL

End of life (C1-C4)
According to information from manufacturers, it can be assumed that 70 % of WPC products are subject to material recycling and 30 % thermal recycling. Material and thermal recycling is declared in 100 % scenarios.

The average transportation distance between the consumer and the waste disposal facility is 250 km.

Re-Use, recovery and recycling potential (D), relevant scenario information
The energy (electrical and thermal) or the created recycling material resulting from the thermal and material recycling of the waste is credited here. The efficiency of the waste recycling facilities is 66 % for German facilities and 69 % for European facilities. The data records used are based on German and European recycling facilities. The data records for electricity and heat are "DE:power mix" (production mix) and "DE: process steam" from natural gas 85 %, from GaBi 6.4.

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				NEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling- potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	MND	MND	X	MNR	MNR	MNR	MND	MND	MND	X	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 m² WPC cladding profile

Parameter	Unit	A1-A3	A4	B2	C2	C3/1	C3/2	D/1	D/2
GWP	[kg CO_2-Eq.]	-5.58E-1	2.35E-1	2.27E-1	1.10E-2	8.78E+0	8.78E+0	-2.75E+0	-2.95E+0
ODP	[kg CFC11-Eq.]	3.72E-9	2.83E-13	4.76E-12	1.38E-13	0.00E+0	0.00E+0	2.63E-8	9.24E-10
AP	[kg SO_2-Eq.]	1.76E-2	1.00E-3	5.26E-4	4.88E-4	0.00E+0	0.00E+0	-8.66E-3	-8.59E-3
EP	[kg $(PO_4)^{3-}$-Eq.]	2.05E-3	2.74E-4	5.63E-5	1.33E-4	0.00E+0	0.00E+0	-1.16E-3	-9.69E-4
POCP	[kg ethene-Eq.]	2.71E-3	-3.44E-4	7.80E-5	-1.68E-4	0.00E+0	0.00E+0	-1.13E-3	-2.36E-3
ADPE	[kg Sb-Eq.]	2.26E-6	1.19E-8	1.14E-6	5.78E-9	0.00E+0	0.00E+0	-1.07E-6	-5.21E-5
ADPF	[MJ]	2.21E+2	3.13E+0	6.63E+0	1.52E+0	0.00E+0	0.00E+0	-1.53E+2	-1.41E+2

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A1: 1 m² WPC cladding profile

Parameter	Unit	A1-A3	A4	B2	C2	C3/1	C3/2	D/1	D/2
PERE	[MJ]	1.23E+0	2.39E-1	2.58E-1	1.17E-1	0.00E+0	0.00E+0	-1.77E+1	-1.04E+0
PERM	[MJ]	8.41E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-9.11E+1
PERT	[MJ]	8.53E+1	2.39E-1	2.58E-1	1.17E-1	0.00E+0	0.00E+0	-1.77E+1	-9.21E+1
PENRE	[MJ]	9.40E+1	3.14E+0	4.48E+0	1.53E+0	0.00E+0	0.00E+0	-1.66E+2	-8.57E+0
PENRM	[MJ]	1.41E+2	0.00E+0	2.38E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.31E+2
PENRT	[MJ]	2.35E+2	3.14E+0	6.86E+0	1.53E+0	0.00E+0	0.00E+0	-1.66E+2	-1.39E+2
SM	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.40E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.19E+1	4.10E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.29E+2	6.45E+0
FW	[m³]	3.39E+1	1.38E-1	9.09E-1	6.73E-2	0.00E+0	0.00E+0	1.14E+1	-1.45E+1

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A1: 1 m² WPC cladding profile

Parameter	Unit	A1-A3	A4	B2	C2	C3/1	C3/2	D/1	D/2
HWD	[kg]	8.19E-5	2.53E-6	1.42E-6	1.23E-6	0.00E+0	0.00E+0	-7.25E-5	-2.41E-5
NHWD	[kg]	1.39E-1	7.84E-4	1.65E-3	3.82E-4	0.00E+0	0.00E+0	-4.56E-2	-1.01E-1
RWD	[kg]	5.59E-3	4.17E-6	9.27E-5	2.03E-6	0.00E+0	0.00E+0	-5.55E-3	-5.07E-4
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.40E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.79E+0	3.90E-1	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

GWP: Share of biogenic CO_2 A1-3: -8,78 kg CO_2-equiv., C3: 8,78 kg CO_2-equiv.

References

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Product Category Rules for Construction Products, Part B: Requirements to be met by the EPD for cladding profiles made of wood-based materials (WPC), 2014

Waste Wood Ordinance
Ordinance governing the requirements on utilisation and disposal of waste wood (AltholzV), 2012

DIN EN 13501-1
Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests, German version EN 13501-1:2007+A1:2009

DIN EN 13501-5
Fire classification of construction products and building elements - Part 5: Classification using data from external fire exposure to roofs tests; German version EN 13501-5:2005+A1:2009

DIN 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 characterisation of compounds and products; German version EN 15534-1:2014

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Ordinance governing the European Waste Classification (Waste Classification Ordinance, AVV), 2001

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