ENVIRONMENTAL PRODUCT DECLARATION

According to /ISO 14025/ and /EN 15804/

Declaration holder	**Binderholz GmbH Solid wood panel factory**
Editor	Institut Bauen und Umwelt e.V. (IBU)
Programme operator	Institut Bauen und Umwelt e.V. (IBU)
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binderholz Massivholzplatte - binderholz solid wood panel - Pannello massiccio binderholz

Binderholz GmbH Solid Wood Panel Factory

Institut Bauen und Umwelt e.V.

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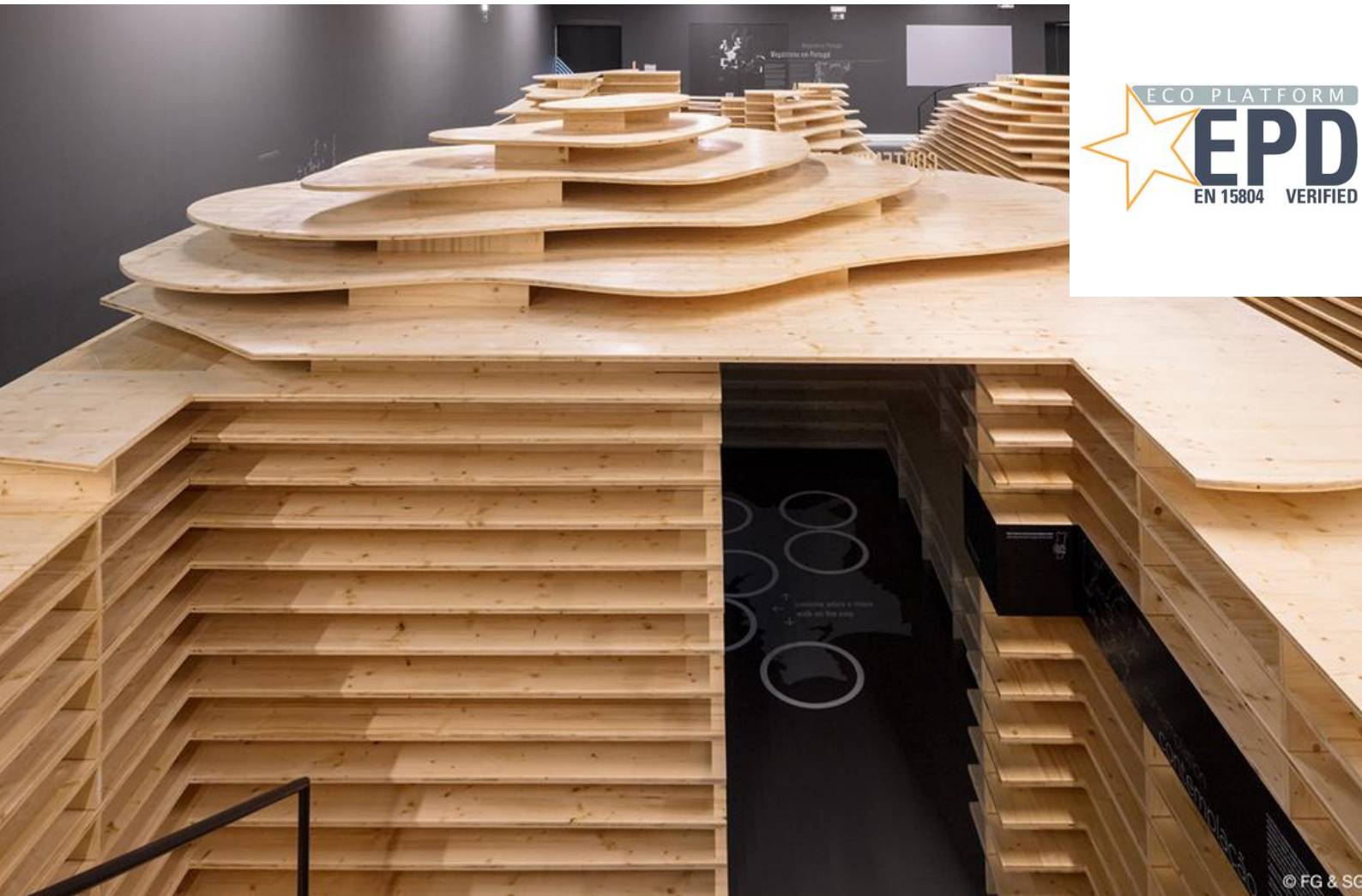

1. General information

Binderholz GmbH - Solid Wood Panel Factory	binderholz solid wood panel
Programme operator IBU - Institut Bauen und Umwelt e.V. Panoramastrasse 1 10178 Berlin Germany	**Declaration holder** Binderholz GmbH Massivholzplattenwerk Zillertalstraße 39 6263 Fügen Austria
Declaration number EPD-BBS-20190170-IBA1-EN	**Declared product / unit** 1 m³ binderholz solid wood panel
This declaration is based on the following product category rules: Solid wood panel products,12.2018 (PCR tested and approved by an independent expert council (IEC))	**Area of application:** The data basis for preparing the ecological balance is the solid wood panel production data of "Binderholz GmbH Solid Wood Panel Factory" in St. Georgen near Salzburg. The present environmental product declaration applies to binderholz solid wood panels.
Date issued 29.11.2019	
Valid until 28.11.2024	The declaration holder is responsible for the underlying information and proofs. IBU cannot be held liable for any producer information, ecological balance data and proofs.
	Verification European standard /EN 15804/ serves as core PCR Independent verification of the declaration and information according to /ISO 14025:2010/ ☐ internal ☒ external
Prof. Dr.-Ing. Horst J. Bossenmayer (President of the "Institut Bauen und Umwelt e.V.")	
Dr. Alexander Röder (Managing Director of IBU)	Matthias Klingler, (Independent verifier, appointed by the IEC)

2. Product

2.1 Product description/definition

binderholz solid wood panels are single-ply or multi-ply panel-shaped solid wood products. In multi-ply panels, the single softwood layers are glued together at right angle.
binderholz solid wood panels are produced according to /EN 13986/.

The lamellae are mechanically sorted for quality, to ensure an even wood pattern with a minimum of cracks. The cross-wise arrangement and symmetric structure of binderholz multi-ply solid wood panels result in a high degree of dimensional stability.

The range of binderholz solid wood panels comprises single-ply and 3-ply as well as 5-ply solid wood panels.

binderholz solid wood panels are used for visual purposes or as load-bearing elements both in dry and wet areas and also outdoor.

Regulation (EU) No. 305/2011 dated 09.03.2011 applies to the placing on the market of the panels in the EU /EFTA with the exception of Switzerland.
For use in the building industry, the products must be accompanied by a declaration of performance (DOP) having regard to /DIN EN 13986:2015-06/, Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking - as well as the CE certificate. The use of the panels is subject to the respective national stipulations.

The pertinent declarations of performance of binderholz solid wood panels are available at **www.binderholz.com**.

2.2 Use

binderholz solid wood panels are used for visually demanding interior structures and for furniture.
For structures, multi-ply solid wood panels are used as load-bearing elements and as reinforcing components.

2.3 Technical data

binderholz solid wood panels are produced at 8% wood moisture (single-ply) to 10% wood moisture (multi-ply panels).

Each lamella is checked for quality according to /EN 13017-1/, ensuring a targeted classification as quality 0, A, B or C.

Depending on the installation situation, the performance data of binderholz multi-ply panels is set / assessed statically as panel or disc load. The strength and stiffness values vary depending on the nominal thickness range.

Structural engineering data

Designation	Values for	Unit
Wood types according to trade names under /EN 1912/	Spruce, fir, pine, larch, Douglas fir and Swiss-stone pine	-
Wood moisture acc. to /EN 13183-2/	8 +/- 2	%
Bending strength, parallel to the grain (panel load) acc. to /EN 13353/	12 to 35	N/mm²
Bending strength, perpendicular to the grain (panel load) acc. to /EN 13353/	5 to 9	N/mm²
Shear strength, parallel to the grain (panel load) acc. to /EN 13353/	1.4 to 1.6	N/mm²
Shear strength, perpendicular to the grain (panel load) acc. to /EN 13353/	1.4	N/mm²
Bending strength, parallel to the grain (disc load) acc. to /EN 13353/	10 to 25	N/mm²
Bending strength, perpendicular to the grain (disc load) acc. to /EN 13353/	12	N/mm²
Tensile strength, parallel to the grain (disc load) acc. to /EN 13353/	6 to 16	N/mm²
Tensile strength, perpendicular to the grain (disc load) acc. to /EN 13353/	6	N/mm²
Compressive strength, parallel to the grain (disc load) acc. to /EN 13353/	10 to 16	N/mm²
Compressive strength perpendicular to the grain (disc load) acc. to /EN 13353/	10 to 16	N/mm²
Shear strength, parallel to the grain (disc load) acc. to /EN 13353/	2.5 to 4	N/mm²
Shear strength, perpendicular to the grain (disc load) acc. to /EN 13353/	2 to 5	N/mm²
Flexural modulus of elasticity, parallel to the grain (panel load) acc. to /EN 13353/	7100 to 10000	N/mm²
Flexural modulus of elasticity, perpendicular to the grain (panel load) acc. to /EN 13353/	550 to 1500	N/mm²
Shear modulus, parallel to the grain (panel load) acc. to /EN 13353/	41	N/mm²
Shear modulus, perpendicular to the grain (panel load) acc. to /EN 13353/	41	N/mm²
Flexural modulus of elasticity, parallel to the grain (disc load) acc. to /EN 13353/	1800 to 4700	N/mm²
Flexural modulus of elasticity, perpendicular to the grain (disc load) acc. to /EN 13353/	3500 to 4700	N/mm²
Tensile modulus of elasticity, parallel to the grain (disc load) acc. to /EN 13353/	2400 to 4700	N/mm²
Tensile modulus of elasticity, perpendicular to the grain (disc load) acc. to /EN 13353/	2900	N/mm²
Shear modulus, parallel to the grain (disc load) acc. to /EN 13353/	470	N/mm²
Shear modulus, perpendicular to the grain (disc load) acc. to /EN 13353/	470	N/mm²
Surface quality (possible qualities are to be stated)	0, A, B, C	-
Thermal conductivity acc. to /EN 13986/	0.09 to 0.13	W/(mK)
Resistance to water vapour diffusion acc. to /EN 12524/	50 to 200	-
Average raw density (u=11%)	472	kgs/m³

The product performance values are those of the Performance Declaration in relation to its essential characteristics according to /EN 13986:2015-06/, wood-based materials for use in the building industry. Characteristics, assessment and marking.

2.4 Available dimensions and types

The following dimensions are available for binderholz solid wood panels:

binderholz single-ply / multi-ply solid wood panels
Thickness: 12, 16, 19, 22, 27, 32, 35, 40, 42, 50, 52, 60 mm
Widths: 1.25 and 2.05 m
Lengths: 5.00 and 6.00 m

binderholz 3-ply solid wood panels for use in construction
Thickness: 12, 16, 19, 22, 27, 32, 35, 40, 42, 50, 52, 60 mm
Widths: 1.25 and 2.05 m (can be cut to size)
Length: 5.00 m

The dimensional tolerances are those stipulated in /EN 13353/.

2.5 Basic and auxiliary materials

binderholz solid wood panels are made from at least one layer of board lamellae, whose narrow sides are glued together. Multi-ply binderholz solid wood panels are made from board lamellae that are glued together crosswise, with an uneven number of layers. Each lamella is first dried in a kiln and sorted.

The narrow sides of the board lamellae are glued together using partly melt adhesives and melamine urea formaldehyde glues (MUF glues). Surface bonding of multi-ply panels is carried out using MUF glues.

binderholz solid wood panels contain none of the substances on the /ECHA candidate list/ (status as of 15.01.2019) above 0.1% weight by weight. binderholz solid wood panels do not contain any further CMR category 1A / 1B substances not included in the candidate list, above 0.1% weight by weight. No biocide products were added to the present panels for construction and they were not treated with biocide products (thus, they are not deemed as treated goods acc. to the /Biocide Product Regulation / (EU) No. 528/2012).

For the present environmental product declaration, the following averaged constituents are calculated per cubic metre of binderholz solid wood panels:

- softwood (mainly spruce): 90.96%
- Water: 7.00%
- MUF glue: 2.04%

binderholz solid wood panels have a calculated averaged raw density (u=7.69%) of 460 kgs/m³.

2.6 Manufacture

binderholz solid wood panels are made from spruce, fir, pine, larch, Douglas fir and Swiss-stone pine, with such species as fir, Douglas fir, larch and Swiss-stone pine serving mainly as visually attractive top layers.

Kiln-dried softwood lamellae with 8% +/-2% wood moisture are used after four-sided planing and mechanical sorting according to their surface quality. The thickness of the single lamellae after planing ranges from 4 to 20 mm, for a width range from 120 to 130 mm.

Narrow-side gluing of the single lamellae and surface gluing of the multi-ply structures is carried out using the glues listed in chapter 2.5.

When the glue has cured completely, the panel surface is subjected to a final machining process and/or an optional, custom-tailored processing of binderholz solid wood panels.

2.7 Environmental and health issues during manufacture

The exhaust air from the process is cleaned in accordance with the legal requirements. The waste water from the process is fed to the local sewer system. Where noise-intensive machines are used, they will be enclosed for sound absorption by constructional measures.

2.8 Product processing/installation

binderholz solid wood panels are processed with the usual tools suited for solid wood treatment. The instructions on the safety of work must be observed both when processing and installing the panels.

2.9 Packing

As packing material, polyethylene (PE) sheets are used (waste code 15 01 02 acc. to /AVV - Waste List Ordinance/).

2.10 Use status

The basic material composition stated in Chapter 2.5 corresponds to the composition over the time of use. During use, approximately 209 kgs of carbon are sequestered in one cubic metre of binderholz solid wood panels, corresponding to approx. 767 kgs of CO_2 equivalent for complete oxidation.

2.11 Environmental and health issues during use

Environmental protection: provided that the binderholz solid wood panels are used for the intended purposes, they do not pose any risk for water, air, and soil.
Health protection: According to the current state of knowledge, no harms to and adverse effects on health are to be expected.
Where formaldehyde is concerned, binderholz solid wood panels are low-emission products due to the low glue content, the structure of the panels and their application.
Due to the use of MUF glues for gluing, binderholz solid wood panels emit formaldehydes in the range of 25µg/m³ (0.02 ppm).
Compared to the limit value (0.1 ml/m³ - 0.124 mg/m³) these values are to be classified as low acc. to /EN 717-1/.

2.12 Reference useful life

The components and the manufacture of binderholz solid wood panels are identical to those of glue-laminated timber (glulam), which has been used in the building industry for over a hundred years. Accordingly, no end to their durability is known or to be expected, if the panels are used for the intended purposes.

Therefore, the useful life of binderholz solid wood panels is assumed to be identical to the overall useful life of the respective building, with the proviso of use for the intended purpose.

Age-related impacts on binderholz solid wood panels may result from their use according to the rules of engineering.

2.13 Exceptional impacts

Fire

binderholz solid wood panels are classified under material class D (/EN 13986/), the toxicity of combustion gases being equivalent to that of natural wood.

Fire protection

Designation	Value
Material class	D
Flaming droplets	d0
Flue gas evolution	s2

Water
No substances are washed out that would pose a risk to water.

Mechanical destruction
Solid wood lamellae are used for the manufacture of binderholz solid wood panels, which therefore have a fracture pattern that is characteristic of solid wood.

2.14 End-of-life use
Due to their monolithic structure, binderholz solid wood panels can be reused or used for other purposes without any problem if they are selectively dismantled.

If they cannot be reused as such, binderholz solid wood panels can be used for producing process heat and electricity in thermal utilisation thanks to their high thermal value of approx. 19 MJ/kg. If used for energy production, the requirements of the Bundes-Immissionsschutzgesetz (/BImSchG/) must be observed. binderholz solid wood panels are classified under waste class 17 02 01 according to the /AVV/ Annex III (Waste Wood ordinance (waste wood V/) dated 15.02.2002.

2.15 Disposal
Waste wood must not be landfilled acc. to Article 9 /Waste Wood V/.

2.16 Further information
Extensive information is available at:
www.binderholz.com

3. LCA: Rules of calculation

3.1 Declared unit
The declared unit of ecological assessment is one cubic metre of binderholz solid wood panels, by taking account of the glue used acc. to Chapter 2.5 and a weight of 460 kgs/m³ at 7.69% wood moisture, which corresponds to a water portion of 7%, the glues correspond to a 2% portion. The statements concerning the glues used were calculated on the basis of specific data.

Statement of the declared unit

Designation	Value	Unit
Declared unit	1	m^3
Raw density	460	kgs/m^3
Thickness	0.0223	m
Wood moisture at delivery	7.69	%
Conversion factor to1 kg	0.0021739	-

3.2 System limit
The declaration type corresponds to EPD, "from cradle to gate with options". Its contents are the production stage, from the provision of the raw materials to the gate of the producer (*cradle-to-gate*, Modules A1 to A3), as well as Module A5 and parts of the end of life (Modules C2 and C3). In addition, an assessment of the potential benefits and drawbacks beyond the end of life of the product is made (Module D).

In detail, Module A1 contains a balance of the provision of the semi-finished wood products and the provision of the glues. The transport of these materials is taken into account in Module A2. Module A3 comprises the provision of the fuels, operating and packing materials, electricity and the on-site manufacturing processes. These are in the essence: splitting and drying of the timber, cutting, panel gluing and pressing, polishing and packing of the products. Module A5 exclusively covers the disposal of the packing, which includes the output of the primary energy (PERM and PENRM) and the biogenic carbon contained in the product packing (GWP).

Module C2 takes the transport to the disposal firm into account, and Module C3, the processing and sorting of the waste wood. In addition, in Module C3, the CO_2-equivalents of the wood-inherent carbon contained in the product are considered as outputs in accordance with /EN 16485/, as is the renewable and non-renewable primary energy contained in the product (PERM and PENRM).

Module D contains a balance of the thermal reuse of the product at the end of its life and the resulting potential benefits and drawbacks in the form of a system extension.

3.3 Assessments and assumptions
Basically, all material and energy flows in the processes required for manufacture are calculated on the basis of questionnaires. The emissions on site caused by the drying of the wood and the curing of the glue used were partly estimated from information in the scientific literature. The latter values are profoundly documented in /Rüter, Diederichs 2012/.

3.4 Cutting rules
None of the relevant material and energy flows was neglected, not even those below the 1% limit. The overall sum of the neglected input flows is thus securely under 5% of the energy and mass input. In addition, this ensures that no material and energy flows are neglected that would have a special potential for significant impacts in relation to environmental indicators.

3.5 Background data
The entirety of the background data was taken from /GaBi Professional Data Base 2019 Edition/ with Service Pack 39 and the concluding report *"Ökobilanz-Basisdaten für Bauprodukte aus Holz"* /Rüter, Diederichs 2012/ (ecological balance basis data for constructional products made from wood).

3.6 Data quality
Validation of the inquired foreground data was based on the mass and on the plausibility criteria. The background data used for materially and energetically exploited wood-based raw materials other than forest wood date from the period 2008 to 2012. The provision of forest wood was taken from a publication from 2008, essentially based on data from 1994 to 1997. The source of all other information is /GaBi Professional Data Base 2019 Edition/ with Service Pack 39. The quality can be generally termed "good".

3.7 Assessment period

The factory data gathered for modelling the foreground system refers to the 2017 calendar year (reference period). The entire information is therefore based on the averaged data of 12 consecutive months

3.8 Allocation

The allocations carried out correspond to the requirements of /EN 15804/ and /EN 16485/. In the essence, the following system extensions and allocations were applied:

In general terms:
Flows of the material-inherent properties (biogenic carbon and the primary energy contained) were basically allocated according to physical causalities. All other allocations to related co-productions were carried out on an economic basis.

Module A1

- Forest: all expenses connected to the forest upstream chain as part of the sawn timber provision were allocated to the products "logs" and "industrial wood" via economic allocation factors and based on their prices.
- Sawn timber upstream chain: all expenses connected to the sawn-timber upstream chain in the debarking, cutting, and drying processes as well as final treatment were allocated to the corresponding main products: logs over bark (oB), sawn timber (fresh), sawn timber (dry) and side products (bark, sawmill residue) via economic allocation factors.

Module A3

- The expenses at the factory can be exactly split among the products manufactured (without related co-production).
- In case of related co-production (e.g. for any industrial wood residues) all expenses previously falling to the main product are allocated to the main product and the side products on an economic basis.
- The disposal of the residues from manufacture is carried out on the basis of a system extension, whose calculation corresponds to a direct loop.

Module D

- The system extension carried out under Module D corresponds to an energetic use scenario for waste wood.

3.9 Comparability

Basically, EPD data cannot be compared or evaluated unless all data sets to be compared have been created acc. to /EN 15804/ and the building context and/or the product-specific performance criteria were taken into account.

The ecological balance modelling was carried out using the /GaBi ts/ software version 9.2.0.58. The entirety of the background data was taken from /GaBi Professional Data Base 2019 Edition/ with Service Pack 39 or from the literature.

4. LCA: Scenarios and further technical information

The scenarios on which the ecological balance is based are outlined in greater detail in the following:

Installation into buildings (A5)
Module A5 is declared, but it contains only information on the disposal of the product packing and none on the actual installation in buildings. The amount of packing material in Module A5 which is produced per declared unit as waste for thermal utilisation and the resulting exported energy are stated in the following in the form of technical scenario information.

Designation	Value	Unit
PE sheet for thermal waste treatment	0.22	kgs
Paper and paper board for thermal waste treatment	0.37	kgs
Other synthetic materials for thermal waste treatment	0.08	kgs
Overall efficiency of thermal utilisation of waste	38	%
Exported electric energy per declared unit	2.30	MJ
Exported thermal energy per declared unit	4.49	MJ

A transport distance of 20 kilometres is assumed for the disposal of the product packing. The overall efficiency of the refuse combustion and the portions of the electric and thermal energy generation using cogeneration correspond to those of the allocated refuse combustion process in the data base /GaBi Professional Data Base 2019 Edition/.

End of life (C1–C4)

Designation	Value	Unit
Waste wood for use as secondary fuel	460	kgs
Redistribution transport distance of the waste wood (Module C2)	20	km

For the thermal utilisation scenario, a collection rate of 100% is assumed without losses caused by comminution of the material.

Reuse, recovery and recycling potential (D), relevant scenario data

Designation	Value	Unit
Lower calorific value of the waste wood when combusted (b.d.)	19.271	MJ/kg
Lower calorific value of the MUF glue	13.25	MJ/kg
Electric energy generated (per b.d. waste wood tonne)	965.5	kWh
Heat generated (per b.d. waste wood tonne)	7034.5	MJ
Electric energy generated (per net flow of declared unit)	410.27	kWh
Heat generated (per net flow of declared unit)	2989.14	MJ

At its end of life, the product is reused as waste wood in the same composition as the declared unit that has been described. Thermal reuse in a biomass power plant with an overall efficiency of 54.54% and electric efficiency of 18.04% is assumed. In doing so, approx. 965.5 kWh of electricity and 7034.5 MJ of usable heat would be produced when burning one tonne of b.d. wood (weight as bone dry, the wood moisture having been taken into account for the efficiency value). For the net flow of the b.d. wood portion input in Module D, with due consideration of the glue portion in the waste wood, this translates into the generation of 410.27 kWh of electricity and 2989.14 MJ of thermal energy per declared unit. The energy exported replaces fuels from fossil sources, whereby it is assumed that the thermal energy would be produced from natural gas and the substituted electricity would correspond to the German electricity mix of 2016.

5. LCA: Results

Information on the system limits (X = contained in the ecological balance; MND = module not declared)

Production stage			Building construction stage		Utilisation stage							Disposal stage				Credits and debits outside system limit
Raw material supply	Transport	Manufacture	Transport from manufacturer to place of use	Installation	Utilisation/use	Maintenance	Repair	Replacement	Renewal	Energy used for building operation	Water used for building operation	Dismantling/ demolition	Transport	Waste treatment	Removal	Reuse, recovery or recycling potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	MND	X	MND	MND	MNR	MNR	MNR	MND	MND	MND	X	X	MND	X

Results of the ecological balance - environmental impacts of 1 cubic m. of binderholz solid wood panels

Para-meter	Unit	A1	A2	A3	A5	C2	C3	D
GWP	[kgs CO_2 eq.]	-6.79E+2	3.07E+1	1.62E+1	1.50E+0	5.37E-1	7.71E+2	-3.94E+2
ODP	[kgs CFC11 eq.]	1.24E-12	5.15E-15	6.62E-12	4.74E-16	9.01E-17	1.80E-13	-9.50E-12
AP	[kgs SO_2 eq.]	3.17E-1	1.30E-1	9.66E-2	2.34E-4	2.27E-3	6.64E-3	-3.70E-1
EP	[kgs $(PO_4)^{3-}$ eq.]	7.71E-2	3.30E-2	2.11E-2	4.36E-5	5.78E-4	1.08E-3	-5.77E-2
POCP	[kgs Ethene eq.]	3.94E-2	-5.36E-2	2.46E-2	1.25E-5	-9.37E-4	4.39E-4	-3.28E-2
ADPE	[kgs Sb eq.]	2.00E-5	2.40E-6	2.62E-5	4.95E-8	4.20E-8	1.80E-6	-9.49E-5
ADPF	[MJ]	1.24E+3	4.23E+2	2.12E+2	3.49E-1	7.39E+0	4.18E+1	-5.30E+3

Caption	GWP = Global warming potential; ODP = Ozone depleting potential; AP = Acidification potential for soil and water; EP = Eutrophication potential; POCP = Photochemical ozone creation potential; ADPE = Abiotic depletion potential for elements (ADP - materials); ADPF = Abiotic depletion potential for fossil fuels (ADP – fossil energy sources)

Results of the ecological balance – resource use: 1 cubic m. of binderholz solid wood panels

Parameter	Unit	A1	A2	A3	A5	C2	C3	D
PERE	[MJ]	1.54E+3	2.46E+1	1.93E+3	5.60E+0	4.30E-1	2.96E+1	-1.57E+3
PERM	[MJ]	8.07E+3	0.00E+0	5.52E+0	-5.52E+0	0.00E+0	-8.07E+3	0.00E+0
PERT	[MJ]	9.60E+3	2.46E+1	1.93E+3	7.98E-2	4.30E-1	-8.04E+3	-1.57E+3
PENRE	[MJ]	1.28E+3	4.24E+2	2.22E+2	1.11E+1	7.42E+0	5.49E+1	-5.98E+3
PENRM	[MJ]	1.22E+2	0.00E+0	1.07E+1	-1.07E+1	0.00E+0	-1.22E+2	0.00E+0
PENRT	[MJ]	1.40E+3	4.24E+2	2.33E+2	3.84E-1	7.42E+0	-6.71E+1	-5.98E+3
SM	[kgs]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.07E+3
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.22E+2
FW	[m^3]	8.94E-1	4.16E-2	8.74E-1	3.46E-3	7.27E-4	1.60E-2	1.13E+0

Caption	PERE = Primary energy, renewable; PERM = Primary energy renewable, materials; PERT = Primary energy renewable, total; PENRE = Primary energy non-renewable, energy resources; PENRM = Primary energy non-renewable, materials; PENRT = Primary energy non-renewable, total; SM = secondary materials; RSF = renewable secondary fuels; NRSF = non-renewable secondary fuels; FW = fresh water resources

Results of the ecological balance - output flows and waste categories: 1 m^3 binderholz solid wood panels

Parameter	Unit	A1	A2	A3	A5	C2	C3	D
HWD	[kgs]	3.17E-5	2.37E-5	8.03E-6	1.55E-9	4.14E-7	4.26E-8	-3.34E-6
NHWD	[kgs]	1.14E+0	3.45E-2	1.08E+0	3.33E-2	6.03E-4	5.68E-2	4.44E+0
RWD	[kgs]	6.48E-2	5.75E-4	8.06E-3	1.37E-5	1.01E-5	5.17E-3	-2.73E-1
CRU	[kgs]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kgs]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MER	[kgs]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.60E+2	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	0.00E+0	2.30E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	0.00E+0	4.49E+0	0.00E+0	0.00E+0	0.00E+0

Caption	HWD = Hazardous waste disposal; NHWD = Non-hazardous waste disposal; RWD = Radioactive waste disposal; CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electric; EET = Exported energy thermal

6. LCA: Interpretation

The focus of the interpretation of the results is placed on the production phase (Modules A1 to A3), because they are based on concrete data supplied by the company. Interpretation is founded on a dominance analysis of the environmental impacts (GWP, ODP, AP, EP, POCP, ADPE, ADPF) and the renewable and non-renewable primary energy sources (PERE, PENRE).

Therefore, the most important factors for the respective categories are mentioned in the following.

6.1 Global warming potential (GWP)

Regarding the consideration of the GWP, the wood-inherent CO_2 product system inputs and outputs need to be discussed separately. Over the entire life cycle,

approx. 931.4 kgs of CO_2 enter the system as carbon stored in the biomass. Of this amount, 72 kgs of CO_2 are emitted in the course of heat generation in the upstream chains (Module A1). A further amount of 91.8 kgs of CO_2 is emitted to the atmosphere as a result of the wood combustion during the manufacturing process (Module A3). The waste treatment of the product packing causes emissions of approx. 0.6 kgs of CO_2, and the amount of carbon finally stored in the solid wood panel is extracted from the system in the course of its reuse as waste wood.

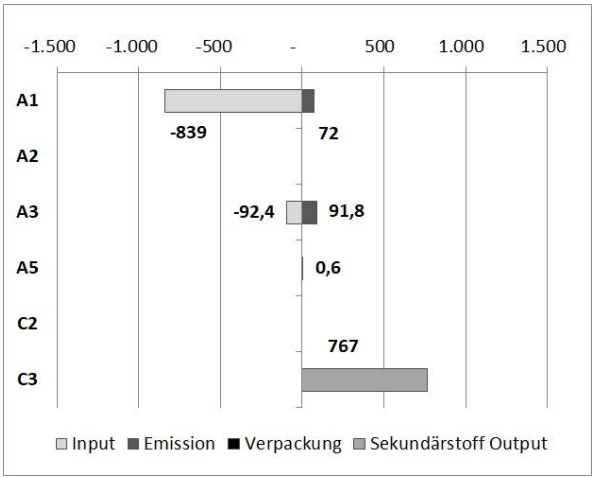

Fig. 1: Wood-inherent CO_2 product system inputs and outputs [kgs of CO_2eq.]. The inverse signs given to the input and output take the ecological balance CO_2 flow consideration into account from the view of the atmosphere.

Due to the pronounced upstream chains and a high share of renewable energies in the production properly speaking, the fossil global warming potential is distributed in the balance as follows: 65% for the provision of the semi-finished goods and glues (entire Module A1); 23% for their transport (entire Module A2) and only 12% for the manufacturing process of the solid wood panels (entire Module A3). Seen in detail, the provision of sawn timber - 52% (Module A1) - and its transport, 21% - and the heat generation in the factory (Module A3) - 9% of the fossil GWP - are essential impact values, while the electric power consumption in the factory (Module A3) makes up for only 1% of the total fossil GWP.

6.2 Ozone depleting potential (ODP)
Of the emissions with an ozone depleting potential; 73% is caused by the provision of the packing material (paper and paperboard) and 10% by the energy consumption in the factory (both in Module A3). Provision of the semi-finished wood products accounts for 14% of the ODP (Module A1).

6.3 Acidification potential (AP)
In the essence, the combustion of wood and Diesel are the major sources of emissions causing possible contributions to the acidification potential. The production of heat for on-site infrastructure projects contributes a total of 10% to the AP (Module A3). The provision of semi-finished wood products and the wood harvest contained in them as well as wood drying account for 56%of the emissions with an acidification potential (Module A1). 23% is due to Diesel combusted during transport of the semi-finished goods to the factory.

6.4 Eutrophication potential (EP)
49% of the total EP caused is due to upstream chain processes for the provision of the semi-finished wood products and a further 9% to the provision of the glues (both in Module A1). Transport of the semi-finished wood products to the factory contributes 24% (Module A2), while heat generation on site accounts for 9% of the EP (Module A3).

6.5 Photochemical ozone creation potential (POCP)
The entire POCP caused by the manufacture (Modules A1–A3) is low (0.01 kgs of ethylene equivalent per declared unit). However, 365% of POCP is emitted through the provision of the semi-finished wood products (Module A1), 234% through emissions from wood drying and curing of the glue in the factory (Module A3) and 16% through the provision of the glues (Module A1). These positive emissions are nearly compensated by the negatively connotated values of the POCP (-518% in relation to the net emission) in Module A2, which explains the high percentages. The negative emissions are due to the negative characterisation factor for the nitrogen monoxide emissions of the /CML-IA/ Version (2001-Apr. 2013) conforming to the standards, in combination with the truck transport process used in /GaBi Professional Data Base 2019 Edition/ for modelling the log transport.

6.6 Abiotic depletion potential for elements (ADPE)
The main constituents of ADPE are caused by the consumption of electric power in the factory (35%, Module A3), the upstream chain of semi-finished wood products (also 35%, Module A1) and the provision of the operating materials (13%, Module A3).

6.7 Abiotic depletion potential for fossil fuels (ADPF)
ADPF is caused by the upstream chain of semi-finished wood products (45%) and provision of the glues (21%). A further 21% is due to the transport of the semi-finished wood products (Module A2). In addition, heat generation in the factory accounts for approximately 8% of the overall ADPF.

6.8 Primary energy renewable (PERE)
The use of PERE is 43% in the upstream chain of semi-finished wood products (Module A1), 26% in electric power consumption and 29% in the production of process heat with wood combustion in the factory (both in Module A3).

6.9 Primary energy non-renewable (PENRE)
The use of PENRE is 48% in the upstream chain of semi-finished wood products (Module A1). In addition, roughly 20% of the PENRE is used for the provision of the glues in Module A1, 19% for the transport of the semi-finished wood products (Module A2) and 8% for heat generation in the factory (Module A3).

6.10 Wastes:
In Module A1, special wastes are created by the provision of sawn timber (50%) and in Module A2, by the transport of the semi-finished goods (35%). A further 9% is due to heat generation in the factory.

Evidence

7.1 Formaldehydes
Test site
Entwicklungs- und Prüflabor Holztechnologie GmbH.
Testing location
Zellescher Weg 24, 01217 Dresden.
Test report and testing period
Test report No. 2117072/QDF/1
Testing period: 21.09.2018 to 11.10.2018
Measuring method and results
The measurements according to /EN717-1/ were uniformly carried out in test chambers at a temperature of 23°C, a relative air humidity of 45% and an air exchange rate of 1 per hour. The formaldehyde emission values are 0.02 mg/m³ of air, thus fulfilling the emission requirements of class E1 according to /EN 13986/ (0.124 mg/m³ of air).

7.2 MDI
Isocyanate-containing substances are not introduced to the wood in the production of binderholz solid wood panels. Accordingly, no methylene diphenyl isocyanates (MDI) can be emitted from the finished product.

7.3 Toxicity of the combustion gases
The toxicity of the combustion gases from binderholz solid wood panels is equivalent to that of natural wood.

7.4 VOC emissions
Test site
Entwicklungs- und Prüflabor Holztechnologie GmbH.
Testing location
Zellescher Weg 24, 01217 Dresden.
Test report and testing period
Test report No. 251340/1
Testing period: 28.02.2012 to 27.03.2012
Measuring method and results
The test in the testing chamber was carried out in accordance with /ISO 16000-9/.

VOC results overview (28 days)

Results	Value	Unit
TVOC (C6 - C16)	90	µg/m³
Sum SVOC (C16 - C22)	0	µg/m³
R (w/o dimension)	0.104	-
VOC w/o NIK	0	µg/m³
Carcinogens	0	µg/m³

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