Vedlegg 6

EPD-ene som har blitt brukt i gjennomføringen av oppgaven.

– Massivtre fra Binderholz

– Massivtre fra Splitkon

– Limtre fra Binderholz

– Limtre fra Moelven

ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	**Binderholz Bausysteme GmbH**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-BBS-20190021-IBB1-EN
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Valid to	19.03.2024

binderholz Brettsperrholz BBS - binderholz X-LAM BBS - binderholz Cross Laminated Timber CLT BBS

Binderholz Bausysteme GmbH

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD EN 15804 VERIFIED

www.ibu-epd.com / https://epd-online.com

1. General Information

Binderholz Bausysteme GmbH	binderholz CLT BBS
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** Binderholz Bausysteme GmbH Zillertalstraße 39 6263 Fügen Österreich
Declaration number EPD-BBS-20190021-IBB1-EN	**Declared product / declared unit** 1 m³ binderholz CLT (Cross Laminated Timber) BBS
This declaration is based on the product category rules: Solid wood products, 12.2018 (PCR checked and approved by the SVR)	**Scope:** The CLT (Cross Laminated Timber) production data from the CLT production facility of Binderholz Unternberg GmbH in Lungau (AT) and the CLT production facility of Binderholz Burgbernheim GmbH based in Burgbernheim in Middle Franconia in Germany, is used as the basis for the life cycle assessment. Together these facilities account for 100 % of the total production of binderholz CLT BBS. This Environmental Product Declaration applies for binderholz CLT BBS. 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.
Issue date 20.03.2019	**Verification** The standard /EN 15804/ serves as the core PCR Independent verification of the declaration and data according to /ISO 14025:2010/ ☐ internally ☒ externally
Valid to 19.03.2024	
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	Matthias Klingler (Independent verifier appointed by SVR)
Dr. Alexander Röder (Managing Director IBU)	

2. Product

2.1 Product description / Product definition

binderholz Brettsperrholz BBS ist ein massives, plattenförmiges Holzbauelement, welches aus zueinander rechtwinklig verklebten Nadelholzlagen besteht. Hergestellt wird das binderholz Brettsperrholz BBS nach der /ETA-06/0009/.

binderholz CLT (Cross Laminated Timber) BBS is a solid, wooden construction element in panel form that consists of softwood layers that are glued together at right angles to each other. binderholz CLT BBS is produced in accordance with /ETA-06/0009/.

The crosswise orientation of the individual lamellae and the usually symmetrical construction of binderholz CLT BBS has the benefit of extremely high dimensional stability, as well as load-bearing potential both lengthways and transversely to the main load-bearing direction.

The cross-section structure of binderholz CLT BBS is characterised by a minimised number of layers, with no less than three and no more than nine layers.

binderholz CLT BBS is available in 2 different formats:

- System format BBS 125: system width 125 cm
- Large format BBS XL: max. width 350 cm

A very high degree of pre-fabrication and thus an extremely short building time can be achieved, thanks to the existing trimming options that are integrated at the production facilities.

EU Regulation No. 305/2011 of 9 March 2011 applies for putting the product into circulation in the EU/EFTA (with the exception of Switzerland).
The products require a declaration of performance under consideration of /ETA-06/0009/ and CE marking. The respective national provisions apply for use. In Germany this means that general building inspectorate approval /abZ-9.1-534/ by the German Institute for Building Technology (Deutsches Institute für Bautechnik) in Berlin is required. The /CSTB Avis Technique 3.3/14-784_V1/ applies in France.

Performance declarations are available for the production facilities Unternberg (BBS 125 / BBS XL) and Burgbernheim (BBS XL).

2.2 Application

binderholz CLT BBS is used in all constructional areas of modern timber construction, ranging from traditional single-family house construction through to structural and bridge engineering.

The respective national regulations apply for using binderholz CLT BBS.

2.3 Technical Data

binderholz CLT BBS is produced with a wood moisture content of 12 % +/- 2 %.

The data included in the declaration of performance applies.
Building-physical properties, such as component resistance and fire resistance, vary depending on the cross-section structure (number of layers, layer thickness) and the load position of the binderholz CLT BBS product. These therefore have to be determined for the structure in question, based on the applicable measurement regulations.

Pursuant to /EN 1995-1-1/ binderholz CLT BBS can be used in service classes 1 and 2 with predominantly static loads.

Preventive chemical wood treatment in accordance with /DIN 68800-3/ can be applied by request. In this context, binderholz CLT BBS can be treated with a class 2 impregnation pursuant to /DIN 68800-3/ to protect it against fungi and insect infestation.

Structural wood protection according to /DIN 68800-2/ is generally preferable.

Constructional data binderholz CLT BBS 125/XL according to ETA

Name	Value	Unit
Wood types by trade names pursuant to /EN 1912/	Spruce, fir, pine, larch, and stone pine	-
Wood moisture content according to /EN 13183-2/	12 +/- 2	%
Use of wood preservatives (wood preservative with approval seal in accordance with /DIN 68800-3/)	Iv, P	-
Modulus of elasticity of slab under stress parallel to the direction of the grain according to /EN 338/	12000	N/mm²
Modulus of elasticity of panel under stress paraelell to the direction of the grain according to /EN 338/	12000	N/mm²
Rolling shear strength of panel under stress according to /EN 338/ (5% fractile value)	1,0	N/mm²
Rolling shear modulus of panel under stress according to /EN 338/ (mean)	50	N/mm²
Length tolerances (BBS 125/XL) according to /ETA-06/0009/	+/- 2	mm
Width tolerances (BBS 125/XL) according to /ETA-06/0009/	+/- 2	mm
Thickness tolerances (BBS 125/XL according to /ETA-06/0009/	+/- 1	mm
Average bulk density (u = 12%)	471	kg/m³
Surface quality	AB - one side residential visible quality BC - one side industrial visible quality NH - C - non-visible	
Thermal conductivity according to /ISO 10456/	0.12	W/(mK)
Specific heat capacity according to /ISO 10456/	1.6	kJ/kgK
Water vapour diffusion resistance factor according to /ISO 10456/	20 - 50	-

2.4 Delivery status

The existing trimming options allow for binderholz CLT BBS to be individually provided in the following dimensions:

BBS 125
Thickness range: 54 to 350 mm
Width range: up to 1.25 m
Length range: up to 5.00 m

The elements of the BBS 125 system format can be connected up to a total length of 20 metres, using a universal finger joint pursuant to /EN 14080/.

BBS XL
Thickness range: 51 to 350 mm
Width range: up to 3.50 m
Length range: up to 22.00 m

2.5 Base materials / Ancillary materials

binderholz CLT BBS consists of at least three panel lamellae that are glued together crosswise, after having been kiln dried and been graded according to strength, either visually or using machinery.

1 component thermoset polyurethane adhesives (1-K-PUR) are used for surface bonding of the board layers. Hot-melt adhesives and small amounts of melamine-urea-formaldehyde glues (MUF) are used for gluing the narrow sides of the lamellae.

Formaldehyde emissions are declared in accordance with /EN 14080/. No very high concern substances according to the /ECHA Candidate List/ (as of: 27 June 2018) for inclusion in appendix XIV of the /REACH Regulation/ are used.

The following averaged percentage shares of materials are assumed per m³ of binderholz CLT BBS in the Environmental Product Declaration:

- Softwood (primarily spruce): 88.28 %
- Water: 10.70 %
- 1-K-PUR glues: 0.985 %
- MUF glues: 0.03 %

An average bulk density (u = 12.1 %) of 470.88 kg/m³ is calculated for binderholz CLT BBS.

2.6 Manufacture

binderholz CLT BBS is made from spruce, fir, pine, larch, and stone pine wood. The wood types fir, larch, and stone pine are used primarily for top layers in visible residential quality.

Kiln dried softwood lamellae with a wood moisture of 12 % +/-2 % are used in production. These are pre-planed on four sides and graded according to strength, either visually or by means of machinery. If individual lamellae posses strength-reducing properties, these can be cut out, and be joined together to form lamellae of unlimited length. The range of thickness for the individual planed lamellae is between 18 and 45 mm at a width ranging between 80 and 250 mm.

The lamellae are glued crosswise using the adhesives listed in chapter 2.5.

Solid wood panels according to /EN 13986/ may be used for producing visual quality top-layers.
After the product has been fully hardened and glued, the surface is finished and the product is trimmed according to customer specifications.

2.7 Environment and health during manufacturing

Arising exhaust air is cleaned pursuant to legal requirements. Process waste water produced is fed into the local sewage system. Structural measures are taken to encase any noisy machinery in sound absorbing housings.

2.8 Product processing/Installation

binderholz CLT BBS can be processed with customary tools that are suitable for solid wood processing. Work safety information must be observed, also in processing / installation.
The current processing guidelines for binderholz CLT BBS are available at www.binderholz.com.

2.9 Packaging

Polyethylene films are used as packaging (/AAV/ waste code 15 01 02).

2.10 Condition of use

The structure of raw materials indicated in chapter 2.5 applies for the composition during the period of use. Around 208 kg of carbon are bound in one m³ of binderholz CLT BBS while in use. This corresponds to a full oxidation of around 762 kg CO2 equivalent.

2.11 Environment and health during use

Protection of the environment: No risks to water, air, and soil can arise if binderholz CLT BBS is used as intended.
Health protection: No health damage or adverse effects are to be expected based on current knowledge.
With regard to formaldehyde, binderholz CLT BBS is to be considered low in emission, due to the low adhesive content, the product's structure, and its type of use. binderholz CLT BBS features formaldehyde emissions of 25 µg/m³ (0.02 ppm), due to the fact that mostly 1-K-PUR glues and only a small share of MUF glues are used.

According to /EN 717-1/ these figures are to be classified as low, based on the limit of 0.1 ml/m³ provided for in the Chemicals Prohibition Ordinance.

The release of methylene diphenyl diisocyanate (MDI) due to the use of PUR glues is not measurable, within the detection limit of 0.05 µg/m³. Owing to MDI's high reactivity towards water (air humidity and wood moisture), it can be assumed that soon after production, binderholz CLT BBS has MDI emissions approaching zero.

2.12 Reference service life

The components and production processes of binderholz CLT BBS correspond to those of glued laminated timber (glulam). Glulam has been used in construction for more than 100 years.
If used as intended, a limit of durability is therefore not known or to be expected.

It is therefore assumed that if used as intended, the duration of use of binderholz CLT BBS corresponds to the overall service life of the respective building.

Age-related factors may apply for binderholz CLT BBS if used in accordance with the rules of engineering.

2.13 Extraordinary effects

Fire

binderholz CLT BBS is categorised as fire safety class D according to /EN 13501-1/. The toxicity of combustion gases corresponds to that of natural, untreated wood.

Fire resistance

Name	Value
Building material class	D
Burning droplets	d0
Smoke gas development	s2

Water

No substances that might pose a threat to water are washed out.

Mechanical destruction

Solid wood lamellae are used for producing binderholz CLT BBS.
binderholz CLT BBS therefore features breaking characteristics that are typical of solid wood.

2.14 Re-use phase

Thanks to its monolithic structure, binderholz CLT BBS can be provided for further or re-use without problems, in the context of selective dismantling.

If material re-use is not possible, binderholz CLT BBS can be used for producing process heat and electricity, thanks to its high heating value of approx. 19 MJ/kg. The requirements of the Federal Pollution Control Act (/BImSchG/) must be observed in energy recovery: according to appendix III of the Waste Wood Ordinance (/AltholzV/) as of 15 February 2002, untreated binderholz CLT BBS is assigned to the /AVV/ waste code 17 02 01. Waste code 17 02 04 applies for treated binderholz CLT BBS, depending on the type of wood preservative used.

2.15 Disposal
Pursuant to § 9 of the Waste Wood Ordinance (/AltholzV/), waste wood must not be disposed of in landfill.

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

3. LCA: Calculation rules

3.1 Declared Unit
The declared unit for the ecological assessment is 1 m³ of CLT BBS, under consideration of the mixture of adhesive used according to chapter 2.5 and a mass of 470.88 kg/m³ at 12.1 % wood moisture content, which corresponds to a water content of 10.7 %. The proportion of adhesives is 1.015 %. All specifications regarding adhesives used were calculated based on specific data.

Specification of the declared unit

Name	Value	Unit
Declared unit	1	m³
Gross density	470.88	kg/m³
Wood moisture at point of delivery	12.1	%
Conversion factor to 1 kg	0.0021236	-
Adhesive content based on total mass	1,015	%
Water content based on total mass	10,7	%

The figures reflect the production volume-weighted average of the following production sites:

- Binderholz Unternberg GmbH, CLT factory, Stranach 26 A-5585 Unternberg
- Binderholz Burgbernheim GmbH, CLT factory, Rothenburger Strasse 46 · D-91593 Burgbernheim

3.2 System boundary
The declaration type corresponds to a “cradle to gate with options” EPD. It covers the production phase from provision of the raw materials through to the factory gates (cradle-to-gate, modules A1 to A3), as well as module A5 and parts of end-of-life (modules C2 and C3). In addition to this, potential benefits and burdens are considered beyond the product’s life cycle (module D).
The provision of wood from the forest and provision of glues are considered in module A1. The transport of these materials is considered in module A2. Module A3 covers the provision of fuels, operating materials, and electricity, as well as the production processes on site. These are primarily trimming, gluing, planing, and profiling processes, as well as packaging of the products. Module A5 covers solely the disposal of the product packaging, including the output of contained biomass carbon and contained primary energy (PERM and PENRM).
Transport to the disposer is considered in module C2, and module C3 covers the processing and sorting of waste wood. In addition to this, the CO2 equivalents of the inherent carbon stored in the wood and renewable and non-renewable primary energy (PERM and PENRM) in accordance with /EN 16485/, are registered as output in module C3.
Thermal recovery of the product at the end of its life, and the resulting benefits and burdens are addressed in module D in the form of a system Extension.

3.3 Estimates and assumptions
All material and energy flows of the processes required for production are generally determined based on questionnaires. The emissions that occur on site, due to combustion and other processes, were in part determined using the results of flue gas analyses, and in part estimated based on literature references. The latter have been documented in detail in /Rüter, S; Diederichs, S: 2012/. All other data is based on average values.
Fresh water resource use was calculated based on blue water consumption.

3.4 Cut-off criteria
No known material or energy flows have been neglected, this applies also to those below the 1 % threshold. It is therefore ensured that the total amount of neglected input flow is below 5 % of energy and mass use. It is therefore further ensured that no material or energy flows are neglected that feature particular potential for significant impact with regard to environmental indicators.

3.5 Background data
All background data was obtained from an integrated life cycle assessment using the /(GaBi) Professional Database 2018 Edition/ and the concluding report “Life cycle assessment source data for wood construction products” ("Ökobilanz-Basisdaten für Bauprodukte aus Holz" /Rüter, S; Diederichts, S: 2012/).

3.6 Data quality
All production sites of binderholz CLT BBS were considered individually, and summarised as production volume-weighted average. The production process at the different facilities is largely identical. In addition to this, a detailed account was drawn up of the relevant upstream chains for any semi-finished wood products used. This also took place based on questionnaires. It can therefore be concluded that the life cycle assessment data feature a good level of robustness. The requested foreground data was validated based on quantity and plausibility criteria. The background data of raw wood materials used for material and energy purposes refers to the years 2008 to 2012, with the exception of forest wood. Data regarding the provision of forest wood was obtained from a publication from 2008 that is based largely on data from the years 1994 to 1997. All other data was obtained from the /GaBi Professional Database 2018 Edition/. The overall quality of the data can be described as good.

3.7 Period under review
The factory data collected for modelling the foreground system refers to the calendar year of 2017 as the reference period. Any information is therefore based on the averaged values for 12 consecutive months.

3.8 Allocation

The allocations performed are in accordance with the requirements of /EN 15804/ and /EN 16485/ and are explained in detail in /Rüter, S; Diederichs, S: 2012/. The following system extensions and allocations have been performed primarily.

General information

Flows of inherent material properties (biomass carbon and primary energy contained) were generally allocated based on physical causalities. All other allocations for related co-productions were made on an economic basis.

Module A1

- Forest: All expenses of the forest wood upstream chain were allocated to the products wood logs and industrial wood based on prices, using economic allocation factors.
- Sawn timber upstream chain: All expenses of the sawn timber upstream chain were allocated to the respective main products (logs without bark (peeled), sawn timber (fresh), sawn timber (dry)) and by-products (bark, industrial residual wood) in the processes of debarking, cutting, as well as drying and finishing, using an economic allocation factor.

Module A3

- All factory expenses for the two locations were attributed to CLT as the main product. No allocations were made.
- The disposal of waste arising in production (except wood-based materials) was carried out based on a system extension.

Module D

- The system extension performed in module D corresponds to an energy recovery scenario for waste wood.

3.9 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.

The used background database has to be mentioned. The life cycle assessment was modelled using the software /GaBi ts/ in its 8.7.0.18 version. All background data was obtained from the /GaBi Professional Database 2018 Edition/ or from literature references.

4. LCA: Scenarios and additional technical information

The scenarios on which the life cycle assessment is based are detailed in the following.

Installation in the building (A5)

While module A5 is declared, it merely contains information about the disposal of the product packaging and no information about the actual installation of the product in the building. The amount of packaging material that arises as waste material for thermal recovery per declared unit in module A5, and the resulting exported energy are indicated below as technical scenario information.

Name	Value	Unit
PE film for thermal waste treatment	1,01	kg
PE plastic for thermal waste treatment	0,63	kg
Total efficiency of thermal waste treatment	44	%
Total of electrical energy exported	9,05	MJ
Total of thermal energy exported	16,31	MJ

A transport distance of 20 km is assumed for disposal of the product packaging. The total efficiency of waste incineration and the proportions of electricity and heat produced through cogeneration correspond to the allocated waste incineration process of the /GaBi Professional Database 2018 Edition/.

End of life (C1 - C4)

Name	Value	Unit
Waste wood for use as secondary fuel	470,88	kg
Redistribution transport distance of waste wood (module C2)	20	km

A collection rate of 100 % without any losses from shredding the material is assumed in the thermal recovery Scenario.

Re-use, recovery, and recycling potential (D), relevant scenario details

Name	Value	Unit
Electricity produced (per t adry waste wood)	968,37	kWh
Exhaust heat used (per t adry waste wood)	7053,19	MJ
Electricity produced (per net flow of the declared unit)	404,91	kWh
Exhaust heat used (per net flow of the declared unit)	2950,04	MJ

At the end of its life, the product is used as waste wood with identical composition as the declared unit. Thermal recovery in a biomass power plant with a total efficiency of 54.69 % and electrical efficiency of 18.09 % is assumed in this context. Around 968.37 kWh electricity and 7053.19 MJ usable heat are produced when burning 1 t adry wood (mass indicated as adry, however, a wood moisture of ~ 18 % is considered when calculating efficiency). Converted into the net flow of the adry wood share flowing in in module D, and considering the adhesive content in the waste

wood, 404.91 kWh electricity and 2950.04 MJ thermal energy are produced per declared unit in module D. The exported energy substitutes fossil fuels. It is assumed in this context that the thermal energy would be produced from natural gas, and that the substituted electricity corresponds to the German electricity mixture of 2018.

5. LCA: Results

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

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS 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	MND	X	MND	MND	MNR	MNR	MNR	MND	MND	MND	X	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m³ CLT BBS

Parameter	Unit	A1	A2	A3	A5	C2	C3	D
GWP	[kg CO_2-Eq.]	-6.83E+2	7.56E+0	1.84E+1	4.08E+0	5.48E-1	7.66E+2	-4.12E+2
ODP	[kg CFC11-Eq.]	3.57E-7	2.09E-13	8.38E-9	1.02E-13	1.51E-14	6.58E-12	-3.46E-10
AP	[kg SO_2-Eq.]	2.85E-1	3.19E-2	9.88E-2	9.74E-4	2.31E-3	6.81E-3	-3.89E-1
EP	[kg $(PO_4)^{3-}$-Eq.]	6.54E-2	8.19E-3	2.07E-2	7.94E-5	5.93E-4	1.11E-3	-6.04E-2
POCP	[kg ethene-Eq.]	6.82E-2	-1.33E-2	1.26E-2	3.38E-5	-9.62E-4	4.52E-4	-3.41E-2
ADPE	[kg Sb-Eq.]	8.01E-5	6.28E-7	2.47E-5	2.89E-7	4.55E-8	3.05E-6	-1.63E-4
ADPF	[MJ]	1.08E+3	1.04E+2	2.64E+2	1.42E+0	7.53E+0	4.33E+1	-5.35E+3

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 - RESOURCE USE: 1 m³ CLT BBS

Parameter	Unit	A1	A2	A3	A5	C2	C3	D
PERE	[MJ]	1.89E+3	5.76E+0	9.89E+2	2.83E-1	4.17E-1	2.71E+1	-1.42E+3
PERM	[MJ]	8.01E+3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-8.01E+3	0.00E+0
PERT	[MJ]	9.90E+3	5.76E+0	9.89E+2	2.83E-1	4.17E-1	-7.98E+3	-1.42E+3
PENRE	[MJ]	1.15E+3	1.04E+2	2.99E+2	6.07E+1	7.56E+0	5.78E+1	-6.08E+3
PENRM	[MJ]	4.78E+1	0.00E+0	5.90E+1	-5.90E+1	0.00E+0	-4.78E+1	0.00E+0
PENRT	[MJ]	1.19E+3	1.04E+2	3.58E+2	1.62E+0	7.56E+0	9.99E+0	-6.08E+3
SM	[kg]	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	8.01E+3
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.78E+1
FW	[m³]	9.53E-1	1.06E-2	3.43E-1	1.01E-2	7.68E-4	1.72E-2	9.21E-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 – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m³ CLT BBS

Parameter	Unit	A1	A2	A3	A5	C2	C3	D
HWD	[kg]	4.68E-2	6.04E-6	1.48E-4	8.92E-9	4.37E-7	4.41E-8	-3.47E-6
NHWD	[kg]	6.90E-1	8.74E-3	3.74E-1	3.80E-1	6.33E-4	5.94E-2	-8.94E-1
RWD	[kg]	4.45E-2	1.43E-4	1.39E-2	7.81E-5	1.03E-5	5.72E-3	-3.01E-1
CRU	[kg]	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	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.71E+2	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	0.00E+0	9.05E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	0.00E+0	1.63E+1	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

6. LCA: Interpretation

The focus area of the interpretation of results is the production phase (modules A1 to A3), as this phase is based on specific information from the company. Interpretation takes place based on a dominance analysis concerning the environmental impact (GWP, ODP, AP, EP, POCP, ADPE, ADPF) and renewable / non-renewable primary energy used (PERE, PENRE). The most important factors of the respective categories are therefore specified in the following.

6.1 Global warming potential (GWP)

Wood inherent CO2 product system input and output deserve special attention when considering the GWP.

A total of around 961 kg CO2 enter the system in the form of carbon stored in the biomass.

140 kg CO2 thereof are emitted in the course of heat production in the upstream chains (module A1). Another 60 kg CO2 are released into the atmosphere as a result of wood combustion during the production process (module A3). The amount of carbon that is finally stored in CLT is removed from the system when the CLT is recovered as waste wood.

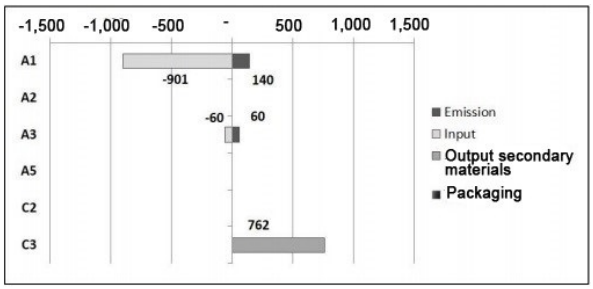


Image 1: Wood inherent CO2 product system input and output [kg CO2 equiv.]. With the inverted algebraic signs of input and output, the CO2 flow consideration is taken into account from the perspective of the atmosphere.

Owing to the pronounced upstream chains and a large share of green electricity used in production, the accounted for fossil greenhouse gases are distributed among the provision of raw materials (75 %, entire module A1), the transport of raw materials (7 %, entire module A2), and the CLT production process (18 %, entire module A3). The provision of sawn timber and solid wood panels (at 54 %), and the provision of adhesives (at 21 %) constitute significant factors of fossil greenhouse gas emissions in particular (both part of module A1), while electricity used in the factory (module A3) accounts for only 7 % of the overall greenhouse gas emissions.

6.2 Ozone depletion potential (ODP)
86 % of emissions with ozone depletion potential arise due to the provision of adhesives (module A1). The provision of semi-finished wood products accounts for 12 % of ODP (also module A1).

6.3 Acidification potential (AP)
Combustion of wood and diesel fuel are the most relevant sources of emissions that potentially contribute to acidification potential. Heat production for infrastructural purposes on site accounts for a total of 15 % of the AP (module A3). Provision of semi-finished wood products and the associated combustion for wood drying, meanwhile account for 61 % of emissions with acidification potential (module A1).

6.4 Eutrophication potential (EP)
62 % of the total arising EP has its origin in the processes of the upstream chains for providing semi-finished wood products, and another 8 % are accounted for by the provision of adhesives (both module A1). The transport of all resources to the factory accounts for 17 % of the EP (entire module A2).

6.5 Ground-level ozone creation potential (POCP)
The key POCP contributors are also accounted for by the provision of semi-finished wood products (95 %, module A1), and by heat production in the factory (14 %, module A3). The negative POCP values registered in module A2 allow for the seeming exceedance of 100 %. These are accounted for by the negative characterisation factor for nitrogen monoxide emissions of the standard compliant /CML-IA/ version (2001 - Apr. 2013) combined with the lorry transport process from the /GaBi Professional Database 2018 Edition/ that was applied for modelling log transport.

6.6 Abiotic depletion potential, concerning resources of non-fossil origin (ADPE)
Significant contributors of ADPE are electricity consumption in the factory (17 %, module A3), the semi-finished wood product upstream chain (24 %, module A1), and the provision of the adhesives used (52 %, module A1).

6.7 Abiotic depletion potential, concerning fossil fuels (ADPF)
ADPF is accounted for mostly by module A1. It arises due to the semi-finished wood product upstream chain (45 %), and the provision of adhesives (30 %). Operating and packaging materials together account for around 10 % of the ADPF.

6.8 Primary energy renewable, energy resources (PERE)
65 % of PERE use is accounted for by the semi-finished wood product upstream chain (module A1), 11 % by electricity consumption, and 23 % by wood combustion for heating purposes in the factory (both module A3).

6.9 Primary energy non-renewable, energy resources (PENRE)
The use of non-renewable primary energy is also accounted for by the semi-finished wood product upstream chain by 46 % (module A1). In addition to this, around 28 % of PENRE use can be attributed to the provision of adhesives in module A1, and only 6 % are accounted for by electricity consumption in the factory (module A3), thanks to the high proportion of green electricity used.

6.10 Waste:
Special waste is produced almost exclusively in the provision of adhesives (approx. 95 %) in module A1.

7. Requisite evidence

7.1 Formaldehyde
Measuring station
TÜV Rheinland LGA Products GmbH.
Place of the inspection
Tillystrasse 2, 90431 Nuremberg.
Inspection report and period
Inspection report no. 21268049 003
Inspection period from 13 December 2016 until 11 January 2017
Measurement method and result
The measurements in accordance with /EN 717-1/ took place in a uniform manner in testing chambers at a temperature of 23 °C, a relative humidity of 50 %, and

an air exchange rate of 0.5/h. The loading factor was 1 m²/m³.
The formaldehyde emissions analysed in accordance with /EN 717-1/ or /ISO 16000-3/ respectively, are 0.02 ppm. Formaldehyde emissions are thus significantly lower than the E1 limit of 0.1 ppm.

7.2 MDI
The MDI contained in the 1-K-PUR glue reacts completely in the gluing process of binderholz CLT BBS. MDI emissions from the set binderholz CLT BBS are therefore not possible.
No MDI emissions can be detected in testing in accordance with /EN 717-2/ (detection limit: 0.05 µg/m³).

7.3 Toxicity of combustion gases
The toxicity of combustion gases that arise when burning CLT corresponds to that of burning natural, untreated Wood.

7.4 VOC emissions
Measuring station
TÜV Rheinland LGA Products GmbH.
Place of the inspection
Tillystraße 2, 60431 Nuremberg.
Inspection report and period
Inspection report no. 21268049 003
Inspection period from 13 December 2016 until 11 January 2017
Measurement method and result
The test chamber examination was performed in accordance with /ISO 16000-9/. The VOC emissions were analysed in accordance with /16000-6/.

AgBB (German Committee for Health-related Evaluation of Building Products) results review after 28 days

Name	Value	Unit
TVOC (C6-C22)	218	µg/m³
Total SVOC (C16-C22)	not detected	-
R (non-dimensional)	0,4	µg/m³
VOC without LIC (lowest concentration of interest)	1,8	µg/m³
carcinogens	n.n.	µg/m³

8. References

/IBU 2016/
IBU (2016): General Programme Instructions for the Preparation of EPDs at the Institut Bauen und Umwelt e.V., Version 1.1 Institut Bauen und Umwelt e.V., Berlin.
www.ibu-epd.de

/ISO 14025/
DIN EN /ISO 14025:2011-10/, Environmental labels and declarations — Type III environmental declarations — Principles and procedures

/EN 15804/
/EN 15804:2012-04+A1 2013/, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

/ISO 16000-3/
DIN ISO 16000-3:2013-01,
Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and testing chambers – sampling by means of a pump.

/ISO 16000-6/
DIN ISO 16000-6:2012-11,
Indoor air – Part 6: Determination of VOC in indoor air and in testing chambers, sampling on Tenax TA®, thermal desorption and gas chromatography using MS or MS-FID.

/ISO 16000-9/
DIN EN ISO 16000-9:2008-04,
Indoor air – Part 9: Determination of emissions of volatile organic compounds from construction products and furnishings – emission testing chamber method.

/ISO 10456/
DIN EN ISO 10456:2010-05,
Construction materials and products – thermal and humidity properties – tabulated measurement data and methods for the determination of thermal nominal and design values.

/EN 16485/
DIN EN 16485:2014-07, Environmental product declaration for logs and sawn timber – product category rules for wood and wood-based materials in the construction industry.

/EN 14080/
DIN EN 14080:2013-09, Timber structures – glued laminated timber and laminated beams - requirements.

/EN 13986/
DIN EN 13986:2015-06, Wood materials for use in the construction industry – properties, compliance assessment, and labelling.

/EN 13501-1/
DIN EN 13501-1:2010-01, Classification of construction products and building types according to their fire behaviour – Part 1: Classification using the results from tests regarding the fire behaviour of construction products.

/EN 13183-2/
DIN EN 13183-2:2002-07, Moisture content of a piece of sawn timber – Part 2: Estimation by means of electrical resistance measurement system.

/EN 1995-1-1/
DIN EN 1995-1-1: 2010-12. Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings.

/EN 1912/
DIN EN 1912:2013-10. Structural timber for load-bearing applications - strength classes - assignment of visual grades and wood types.

/EN 717-1/
DIN EN 717-1:2005-01, Wood-based materials – determination of formaldehyde emission – Part 1: Formaldehyde emission according to the testing chamber method.

/EN 717-2/
DIN EN 717-2:1995-01, Wood-based materials – determination of formaldehyde emission – Part 2: Formaldehyde emission according to the gas analysis method.

/EN 338/
DIN EN 338:2016-07, Structural timber for load-bearing applications - strength classes.

/DIN 68800-1/
DIN 68800-1: 2011-10, Wood treatment – Part 1: General information.

/DIN 68800-2/
DIN 68800-2:2012-02, Wood treatment – Part 2: Preventive structural measures in building construction.

/DIN 68800-3/
DIN 68800-3:2012-02, Wood treatment – Part 3: Preventive protection of wood using wood preservatives.

Further sources:

/abZ Z-9.1-534/
General building inspectorate approval Z-9.1-534 dated 17 November 2014 for binderholz CLT BBS.

/AVV/
List of Wastes Ordinance (Abfallverzeichnis-Verordnung (AVV)) dated 10 December 2001 (Federal Law Gazette (BGBl. I) p. 3379), most recently amended through article 2 of the ordinance as of 17 July 2017 (Federal Law Gazette (BGBl. I) p. 2644).

/AltholzV/
Waste Wood Ordinance (AltholzV): Ordinance concerning the requirements for the recovery and disposal of waste wood, 2017.

/BImSchG/
Federal Pollution Control Act (BImSchG): Law for the protection against harmful impact on the environment through air pollution, noise, vibration, and similar processes, 2017.

/CML-IA/
CML-IA Version 2001-Apr. 2013: Characterisation Factors for life cycle impact assessment.

/ECHA Candidate List/
List of substances considered for approval that give rise to particularly high concern (as of: 27 June 2018) pursuant to article 59 section 10 of the REACH Regulation. European Chemicals Agency.

/ETA-06/0009/
ETA-06/0009 dated 2 June 2017: European technical assessment of binderholz CLT BBS by Binderholz Bausysteme GmbH.

/CSTB Avis Technique 3.3/14-784_V1/
CSTB Avis Technique 3.3/14-784_V1 dated 13 July 2017: Approval for binderholz CLT BBS in France.

/Ganzheitliche Bilanzierung Professional Datenbank 2018 Edition/
(Professional Database for Integrated Life Cycle Assessment, 2018 Edition)
GaBi Professional Datenbank 2018 Edition. (GaBi Professional Database 2018 Edition) thinkstep AG, 2018.

/GaBi ts/
GaBi ts Software Version 8.7.0.18: Software and database for integrated life cycle assessment. thinkstep AG, 2018.

/PCR solid wood products/
Product category rules for building-related products and services. Part B: Environmental Product Declaration requirements for solid wood products, 2019-01. From the Environmental Product Declaration programme by Institut Bauen und Umwelt e.V. (IBU).

/REACH Regulation/
Regulation (EC) No. 1907/2006 of the European Parliament and the Council of 18 December 2006 on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Most recently amended on 25 March 2014.

/Rüter, S.; Diederichs, S:2012/
Rüter, S.; Diederichs, S., 2012: Life cycle assessment source data for wood construction products: work report from the Institute for wood technology and wood biology.

Publisher
Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Programme holder
Institut Bauen und Umwelt e.V.
Panoramastr 1
10178 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Author of the Life Cycle Assessment
Thünen-Institut für Holzforschung
Leuschnerstr. 91
21031 Hamburg
Germany

Tel +49(0)40 73962 - 619
Fax +49(0)40 73962 - 699
Mail holzundklima@thuenen.de
Web **www.thuenen.de**

Owner of the Declaration
Binderholz Bausysteme GmbH
Zillertalstrasse 39
6263 Fügen
Austria

Tel +435288601
Fax +43528860111009
Mail christof.richter@binderholz.com
Web **www.binderholz.com**

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Eier av deklarasjonen:	Splitkon AS
Programoperatør:	Næringslivets Stiftelse for Miljødeklarasjoner
Utgiver:	Næringslivets Stiftelse for Miljødeklarasjoner
Deklarasjonsnummer:	
Publiseringsnummer:	Ikke tildelt
ECO Platform registreringsnummer:	Ikke tildelt
Godkjent dato:	
Gyldig til:	

Krysslimt tre

Splitkon AS

www.epd-norge.no

Generell informasjon

Produkt:

Krysslimt tre

Eier av deklarasjonen:

Splitkon AS
Kontaktperson: Kristine Nore
Telefon: +47 90 94 94 84
e-post: kristine.nore@splitkon.no

Programoperatør:

Næringslivets stiftelse for Miljødeklarasjoner
Pb. 5250 Majorstuen, 0303 Oslo
Phone: +47 23 08 80 00
e-post: post@epd-norge.no

Produsent:

Splitkon AS

Deklarasjonsnummer:

Produksjonssted:

Åmot i Modum kommune

ECO Platform registreringsnummer:

Kvalitet/Miljøsystem:

Deklarasjonen er basert på PCR:

EN 15804:2012+A1:2013 tjener som kjerne-PCR
NPCR015 v. 3 – Part B for wood and wood-based products for use in construction

Org. no.:

995 806 797

Erklæring om ansvar:

Eieren av deklarasjonen skal være ansvarlig for den underliggende informasjon og bevis. EPD Norge skal ikke være ansvarlig med hensyn til produsent informasjon, livsløpsvurdering data og bevis.

Godkjent dato:

Gyldig til:

Deklarert enhet:

1 m3 Krysslimt tre

Årstall for studien:

2019

Deklarert enhet med opsjon:

A1,A2,A3,A4,A5,B1,B2,B3,B4,B5,B6,B7,C1,C2,C3,C4,D

Sammenlignbarhet:

EPD av byggevarer er nødvendigvis ikke sammenlignbare hvis de ikke samsvarer med NS-EN 15804 og ses i en bygningskontekst.

Funksjonell enhet:

Miljødeklarasjonen er utarbeidet av:

Deklarasjonen er utviklet ved bruk av eEPD v3.0 fra LCA.no
Godkjenning:
Bedriftsspesifikke data er

Samlet og registrert av:	Kristine Nore
Kontrollert av:	Lene Weum

Verifikasjon:

Uavhengig verifikasjon av data, annen miljøinformasjon og EPD er foretatt etter ISO 14025:2010, kapittel 8.1.3 og 8.1.4

Ekstern

Tredjeparts verifikator:

Sign

Michael M. Jenssen

(Uavhengig verifikator godkjent av EPD Norge)

Godkjent:

Sign

(Daglig leder av EPD-Norge)

Produkt

Produktbeskrivelse:

Krysslimt tre er stabile elementer med høy stivhet og bæreevne. Krysslimt tre leveres ferdig prefabrikkert til vegg-, dekke og takelementer. Krysslimt tre har en betydelig brannmotstand og en effektiv fuktstabiliserende funksjon der elementene eksponeres i innemiljø.

Produktspesifikasjon:

Krysslimt tre er trelameller som er krysslagt og limt sammen i fra tre til ni lag. Skurlasten som benyttes er fra norske sagbruk. Limet som benyttes er MUF-lim fra Dynea.

Material	%
Trevirke av gran, tørrvekt	88,03
Vanninnhold, i trevirke	10,57
Lim, tørrvekt	1,17
Plastemballasje	0,23

Tekniske data:

Krysslimt tre fra Splitkon leveres i bredde opp til 3,5 meter, lengde opp til 16 meter og tykkelse opp til 0,3 meter. Vi produserer i henhold til EN 16351.

Markedsområde:

Krysslimt tre kan brukes i alle bygg over bakkenivå.

Levetid, produkt:

60 år

Levetid, bygg:

60 år

LCA: Beregningsregler

Deklarert enhet:

1 m3 Krysslimt tre

Cut-off kriterier:

Alle viktige råmaterialer og all viktig energibruk er inkludert. Produksjonsprosessen for råmaterialene og energistrømmer som inngår med veldig små mengder (mindre enn 1%) er ikke inkludert. Disse cut-off kriteriene gjelder ikke for farlige materialer og stoffer.

Allokering:

Allokering er gjort iht. bestemmelser i EN 15804. Inngående energi og vann, samt produksjon av avfall i egen produksjon er allokert likt mellom alle produktene gjennom masseallokering. Miljøpåvirkning og ressursforbruk for primærproduksjonen av resirkulerte materialer er allokert til det opprinnelige produktsystemet. Bearbeidingsprosessen og transport av materialet til produksjonssted er allokert til analysen i denne EPDen.

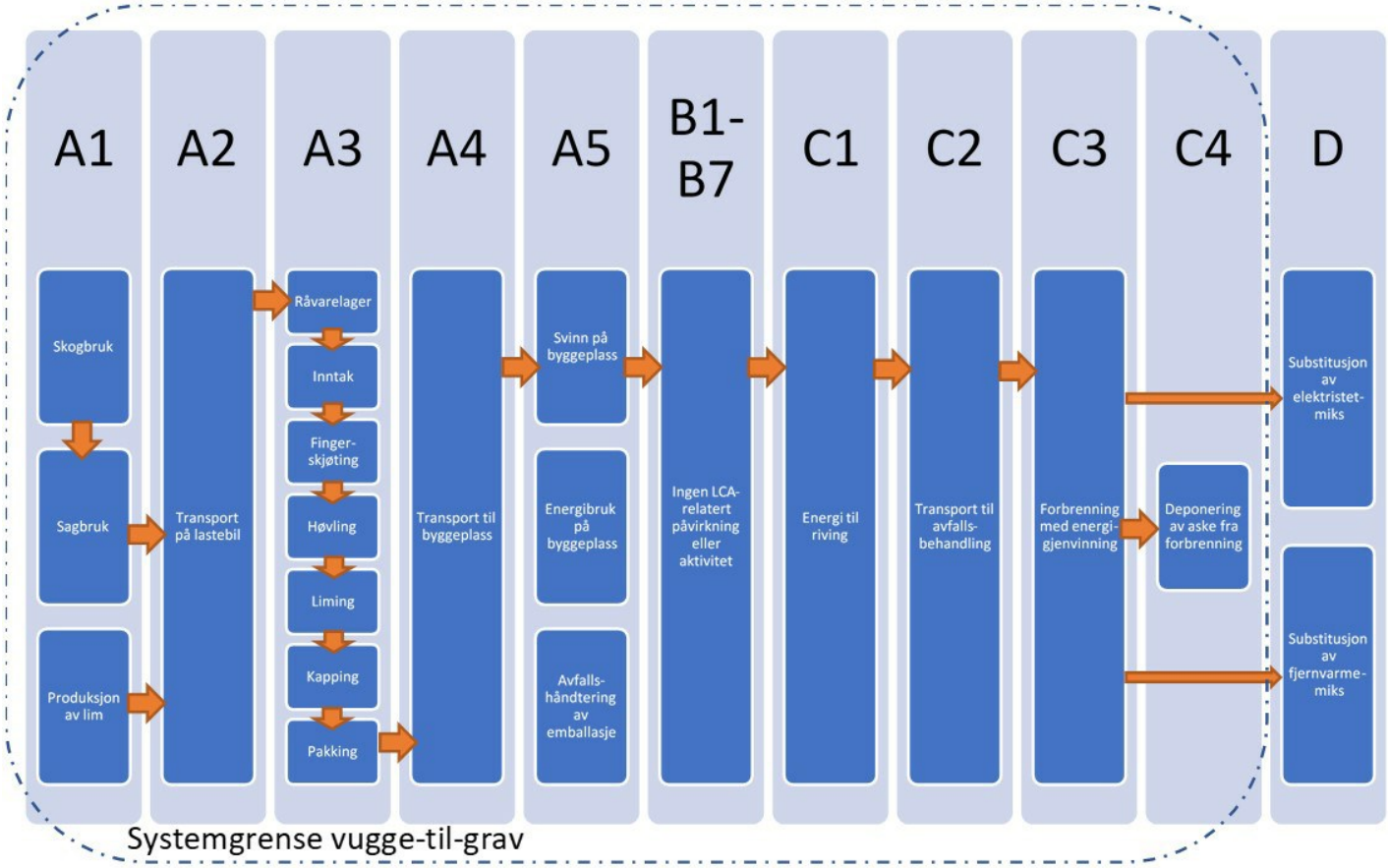
Datakvalitet:

Spesifikke data for produktsammensetningen er fremskaffet av produsenten. De representerer produksjonen av det deklarerte produktet og ble samlet inn for EPD- utvikling i det oppgitte året for studien. Bakgrunnsdata er basert på registrerte EPDer i henhold til EN 15804, Østfoldforskning sine databaser, ecoinvent og andre LCA databaser. Datakvaliteten for råmaterialene i A1 er presentert i tabellen nedenfor.

Materials	Source	Data quality	Year
Emballasje	NorEnviro	Database	2018
Trevirke	NorEnviro	Database	2018
MUF	Supplier	Specific data	2018

Systemgrenser:

Flytskjemaet nedenfor illustrerer systemgrensene for analysen:



Teknisk tilleggsinformasjon

Splitkon bruker limtrelameller som utgangspunkt for sine elementer i krysslimt tre. Standard er T22 i yttersjikt og T15 eller T8 i midtsjiktene, i hht. NS-EN 338.

LCA: Scenarier og annen teknisk informasjon

Følgende informasjonen beskriver scenariene for modulene i EPDen.

Transport fra produksjonssted til bruker (A4)

Type	Kapasitetsutnyttelse inkl retur %	Kjøretøytype	Distanse km	Brennstoff/Energi forbruk	Enhet	Verdi (l/t)
Bil	55,0 %	Truck, over 32 tonnes, EURO 6	82	0,022606	l/tkm	1,85
Jernbane					l/tkm	
Båt					l/tkm	
Annet					l/tkm	

Byggefase A5

.	Enhet	Verdi
Hjelpematerialer	kg	
Vannforbruk	m^3	
Elektrisitetsforbruk	kWh	
Andre energikilder	MJ	1,0000
Materialtap	kg	
Materialer fra avfallsbehandling	kg	0,5400
Støv i luften	kg	
VOC utslipp	kg	

Sluttfase (C1,C3,C4)

.	Enhet	Verdi
Farlig avfall	kg	
Blandet avfall	kg	425,0000
Gjenbruk	kg	
Resirkulering	kg	
Energigjenvinning	kg	425,0000
Til deponi	kg	2,8250

Transport avfallsbehandling (C2)

Type	Kapasitetsutnyttelse inkl retur %	Kjøretøytype	Distanse km	FBrennstoff/Energi forbruk	Enhet	Verdi (l/t)
Truck	55,0 %	Truck, over 32 tonnes, EURO 6	100	0,022606	l/tkm	2,26
Jernbane					l/tkm	
Båt					l/tkm	
Annen transport					l/tkm	

..

Gevinst og belastninger etter endt levetid (D)

.	Enhet	Verdi
Substitution of energy from waste wood incineration, 12,9 MJ per kg dry weight wood, D	MJ/DU	4837,50
Substitution of energy from resin in wood incineration, 11,3 MJ per kg dry weight resin, D	MJ/DU	56,50

LCA: Resultater

Systemgrenser (X=inkludert, MND=modul ikke deklarert, MNR=modul ikke relevant)

Product stage			Construction installation stage		User stage							End of life stage				.	Beyond the system bondaries
Råmaterialer	Transport	Tilvirkning	Transport	Konstruksjons/ installasjonsfase	Bruk	Vedlikehold	Reparasjon	Utskiftinger	Renovering	Operasjonell energibruk	Operasjonell vannbruk	Demontering	Transport	Avfallsbehandling	Avfall til sluttbehandling		Gjenbruk/gjenvinning/ resirkulering-potensiale
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	.	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	.	X

Miljøpåvirkning (Environmental impact)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4
GWP	kg CO_2 -eq	-5,97E+02	2,89E+00	2,39E-01	0	0	0	0
ODP	kg CFC11 -eq	1,21E-05	5,94E-07	2,73E-08	0	0	0	0
POCP	kg C_2H_4-eq	3,64E-02	4,52E-04	4,11E-05	0	0	0	0
AP	kg SO_2 -eq	4,50E-01	7,46E-03	1,12E-03	0	0	0	0
EP	kg PO_4^{3-} -eq	7,92E-02	1,03E-03	2,29E-04	0	0	0	0
ADPM	kg Sb -eq	3,08E-04	6,88E-06	4,55E-07	0	0	0	0
ADPE	MJ	1,15E+03	4,74E+01	2,98E+00	0	0	0	0

Parameter	Unit	B5	B6	B7	C1	C2	C3	C4	D
GWP	kg CO_2 -eq	0	0	0	8,38E-03	3,52E+00	6,97E+02	1,73E-02	-3,03E+01
ODP	kg CFC11 -eq	0	0	0	7,92E-10	7,24E-07	3,56E-07	6,24E-09	-3,43E-06
POCP	kg C_2H_4-eq	0	0	0	1,88E-06	5,51E-04	2,79E-03	5,11E-06	-1,53E-02
AP	kg SO_2 -eq	0	0	0	3,91E-05	9,10E-03	7,00E-02	1,16E-04	-1,51E-01
EP	kg PO_4^{3-} -eq	0	0	0	9,42E-06	1,25E-03	1,88E-02	2,08E-05	-3,86E-02
ADPM	kg Sb -eq	0	0	0	1,37E-07	8,39E-06	6,14E-06	2,25E-08	-5,89E-05
ADPE	MJ	0	0	0	8,50E-02	5,78E+01	1,22E+02	5,64E-01	-3,79E+02

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

Leseeksempel 9,0 E-03 = 9,0*10 -3 = 0,009
*INA Indicator Not Assessed

Ressursbruk (Resource use)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4
RPEE	MJ	2,72E+03	8,62E-01	9,11E-02	0	0	0	0
RPEM	MJ	7,11E+03	0,00E+00	0,00E+00	0	0	0	0
TPE	MJ	9,84E+03	8,62E-01	9,11E-02	0	0	0	0
NRPE	MJ	1,24E+03	4,89E+01	3,15E+00	0	0	0	0
NRPM	MJ	1,35E+02	0,00E+00	0,00E+00	0	0	0	0
TRPE	MJ	1,37E+03	4,89E+01	3,15E+00	0	0	0	0
SM	kg	0,00E+00	0,00E+00	0,00E+00	0	0	0	0
RSF	MJ	7,10E-02	0,00E+00	0,00E+00	0	0	0	0
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0	0	0	0
W	m^3	1,51E+00	1,16E-02	5,58E-04	0	0	0	0

Parameter	Unit	B5	B6	B7	C1	C2	C3	C4	D
RPEE	MJ	0	0	0	1,10E+00	1,05E+00	7,12E+03	9,88E-03	-2,47E+03
RPEM	MJ	0	0	0	0,00E+00	0,00E+00	-7,11E+03	0,00E+00	0,00E+00
TPE	MJ	0	0	0	1,10E+00	1,05E+00	1,11E+00	9,88E-03	-2,47E+03
NRPE	MJ	0	0	0	1,46E-01	5,97E+01	3,36E+01	5,82E-01	-4,65E+02
NRPM	MJ	0	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	0	0	0	1,46E-01	5,97E+01	3,36E+01	5,82E-01	-4,65E+02
SM	kg	0	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0	0	0	1,92E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
W	m^3	0	0	0	6,10E-05	1,41E-02	3,47E-01	6,67E-04	-1,10E-01

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE Total use of non renewable primary energy resources; SM Use of secondary materials; RSF Use of renewable secondary fuels; NRSF Use of non renewable secondary fuels; W Use of net fresh water

Leseeksempel 9,0 E-03 = 9,0*10 -3 = 0,009
*INA Indicator Not Assessed

Livsløpets slutt - Avfall (End of life - Waste)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4
HW	kg	8,30E-02	2,61E-05	2,10E-06	0	0	0	0
NHW	kg	6,68E+01	4,47E+00	1,16E-01	0	0	0	0
RW	kg	INA*	INA*	INA*	0	0	0	0

Parameter	Unit	B5	B6	B7	C1	C2	C3	C4	D
HW	kg	0	0	0	1,88E-07	3,18E-05	9,11E-05	2,09E-07	-5,25E-04
NHW	kg	0	0	0	1,11E-02	5,45E+00	3,96E+00	2,85E+00	-1,68E+01
RW	kg	0	0	0	INA*	INA*	INA*	INA*	INA*

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

Leseeksempel 9,0 E-03 = 9,0*10 -3 = 0,009
*INA Indicator Not Assessed

Livsløpets slutt - Utgangsfaktorer (End of life - Output flow)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4
CR	kg	1,20E-01	0,00E+00	0,00E+00	0	0	0	0
MR	kg	2,10E-03	0,00E+00	4,88E-01	0	0	0	0
MER	kg	8,11E-03	0,00E+00	0,00E+00	0	0	0	0
EEE	MJ	INA*	INA*	INA*	0	0	0	0
ETE	MJ	INA*	INA*	INA*	0	0	0	0

Parameter	Unit	B5	B6	B7	C1	C2	C3	C4	D
CR	kg	0	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MR	kg	0	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	0	0	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0	0	0	INA*	INA*	INA*	INA*	INA*
ETE	MJ	0	0	0	INA*	INA*	INA*	INA*	INA*

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

Leseeksempel 9,0 E-03 = 9,0*10 -3 = 0,009
*INA Indicator Not Assessed

Norske tilleggskrav

Klimagassutslipp fra bruk av elektrisitet i produksjonsfasen

Nasjonal produksjonsmiks fra import, lavspenning (inkludert produksjon av overføringslinjer, i tillegg til direkte utslipp og tap i nett) er brukt for anvendt elektrisitet i produksjonsprosessen (A3). Bakgrunnsdata er presentert i tabellen under. Karakteriseringsfaktorer fra EN15804:2012+A1:2013 er benyttet.

Elektrisitetsmiks	Datakilde	Mengde	Enhet
El-mix, Norway (kWh)	ecoinvent 3.4	31,04	g CO2-ekv/kWh

Farlige stoffer

Produktet er ikke tilført stoffer fra REACH Kandidatliste eller den norske prioritetslisten.

Inneklima

Krysslimt tre fra Splitkon er i SINTEF Teknisk godkjenning nr. 20712g bedømt å ikke avgi partikler, gasser eller stråling som gir negativ påvirkning på inneklimaet, eller har helsemessig betydning.

Klimadeklarasjon

For å øke transparensen i bidraget til klimapåvirkning, så er indikatoren GWP blitt delt opp her i underindikatorer:
GWP-IOBC Klimapåvirkning beregnet etter umiddelbar oksidasjon av biogent karbon prinsippet.
GWP-BC Klimapåvirkning fra netto opptak og utslipp av biogent karbon fra materialene i hver modul.

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4
GWP-IOBC	kg CO_2 -eq	9,03E+01	2,89E+00	2,39E-01	0	0	0	0
GWP-BC	kg CO_2 -eq	-6,87E+02	0,00E+00	0,00E+00	0	0	0	0
GWP	kg CO_2 -eq	-5,97E+02	2,89E+00	2,39E-01	0	0	0	0

Parameter	Unit	B5	B6	B7	C1	C2	C3	C4	D
GWP-IOBC	kg CO_2 -eq	0	0	0	8,38E-03	3,52E+00	9,61E+00	1,73E-02	-3,03E+01
GWP-BC	kg CO_2 -eq	0	0	0	0,00E+00	0,00E+00	6,88E+02	0,00E+00	0,00E+00
GWP	kg CO_2 -eq	0	0	0	8,38E-03	3,52E+00	6,97E+02	1,73E-02	-3,03E+01

Bibliografi

NS-EN ISO 14025:2010 Miljømerker og deklarasjoner - Miljødeklarasjoner type III - Prinsipper og prosedyrer.
NS-EN ISO 14044:2006 Miljøstyring - Livsløpsvurderinger - Krav og retningslinjer.
NS-EN 15804:2012+A1:2013 Bærekraftig byggverk - Miljødeklarasjoner - Grunnleggende produktkategoriregler for byggevarer.
ISO 21930:2017 Sustainability in buildings and civil engineering works -
Core rules for environmental product declarations of construction products and services.
ecoinvent v3, Allocation, cut-off by classification, Swiss Centre of Life Cycle Inventories.
Iversen et al., (2018) eEPD v3.0 - Background information for EPD generator system. LCA.no rapportnummber 04.18.

Tellnes, L. G. F. (2019). Storformatproduksjon av krysslimt tre. LCA-rapport for EPD-generator. OR.19.18 fra Østfoldforskning, Fredrikstad, Norge.

NPCR015 version 3.0. Product category rules for wood and wood-based products for use in Construction.

NS-EN 16351:2015. Trekonstruksjoner - Krysslimt massivtreelement - Krav

	Programoperatør og utgiver Næringslivets Stiftelse for Miljødeklarasjoner Pb. 5250 Majorstuen 0303 Oslo Norway	Telefon: e-post: web:	+47 23 08 82 92 post@epd-norge.no www.epd-norge.no
SPLITKON	**Eier av deklarasjon** Splitkon AS Industriveien 3 3340 Åmot	Telefon: Fax: e-post: web:	+47 90 94 94 84 kristine.nore@splitkon.no www.splitkon.no
Østfoldforskning	**Forfatter av livsløpsrapporten** Østfoldforskning AS Stadion 4 1671 Kråkerøy	Telefon: Fax: e-post: web:	+47 69 35 11 00 +47 69 34 24 94 www.ostfoldforskning.no
LCA.no	**Utvikler av EPD-generator** LCA.no AS Dokka 1C 1671 Kråkerøy	Telefon: e-post: web:	+47 916 50 916 post@lca.no www.lca.no

ENVIRONMENTAL PRODUCT DECLARATION

According to /ISO 14025/ and /EN 15804/

Declaration holder	**Binderholz GmbH Glue-laminated timber factory**
Editor	Institut Bauen und Umwelt e.V. (IBU)
Programme operator	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-BBS-20190164-IBA1-EN
ECO EPD Ref. No.	ECO-00001052
Date issued	29.11.2019
Valid until	28.11.2024

binderholz Glulam - binderholz Bois lamelle-colle BSH - Legno lamellare BSH binderholz - binderholz BSH glulam

Binderholz GmbH Glue-laminated timber factory

www.ibu-epd.com / https://epd-online.com

1. General information

Binderholz GmbH - Glulam factory

Programme operator
IBU - Institut Bauen und Umwelt e.V.
Panoramastrasse 1
10178 Berlin
Germany

Declaration number
EPD-BBS-20190164-IBA1-EN

This declaration is based on the following product category rules:
Solid wood products,12.2018
(PCR tested and approved by an independent expert council (IEC))

Date issued
29.11.2019

Valid until
28.11.2024

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of the "Institut Bauen und Umwelt e.V.")

Dr. Alexander Röder
(Managing Director of IBU)

binderholz BSH glue-laminated timber (glulam)

Declaration holder
Binderholz GmbH
Zillertalstraße 39
6263 Fügen
Austria

Declared product / unit
1 m³ binderholz BSH glue-laminated timber (glulam)

Area of application:
The data basis for preparing the ecological balance is the glue-laminated timber production data of "Binderholz GmbH glue-laminated timber factory" in Jenbach.

In total, the production data covers 100% of the overall production of binderholz BSH glue-laminated timber (glulam).

The present environmental product declaration applies to binderholz BSH glue-laminated timber.

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

Matthias Klingler,
(Independent verifier, appointed by the IEC)

2. Product

2.1 Product description/definition

Binderholz BSH glue-laminated timber is a solid, bar-shaped wooden component. It consists of at least three grain-parallel lamella glued to each other and is produced in accordance with /EN14080/.

The lamellae are mechanically sorted for strength and the optical and physical properties of the material are homogenised. This results in a high degree of dimensional stability and load bearing capacity.

Binderholz BSH glulam comes as standard or as consignment product and also in specific sizes and setups.

Several manual and mechanical trimming options are integrated in the factory, enabling a high level of prefabrication, which results in very short construction and site installation times.

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 having regard to /EN 14080/ as well as the CE certificate. Use of the timber is subject to the respective national stipulations.

The declarations of performance are available at **www.binderholz.com**.

2.2 Use

Binderholz BSH glue-laminated timber is used for all areas of up-to-date wood structures, from engineered residential and industrial constructions to bridge building.
Use of binderholz glulam is subject to the respective national stipulations.

2.3 Technical data

Binderholz glue-laminated timber is produced at 9-14% wood moisture.

The data contained in the Declaration of Performance shall be applicable.
Depending on the cross section structure (number and thickness of layers), and the position of the load acting on binderholz BSH glulam, the building-physics properties (building component resistance and fire resistance) will vary. The usual strength classes according to /EN 1995-1-1/ are GL 24, GL 28 and GL 30. These classes are valid both for the combined structure (c) and the homogenous structure (h).
Upon inquiry, Glulam is also available in strength class GL 32.
binderholz BSH glulam can be used in utility classes 1 to 3 in accordance with /EN 1995-1-1/.

Preventive chemical wood preservation according to /DIN 68800-3/ can be applied upon inquiry. Binderholz BSH glulam can be treated using a class-2 impregnation agent according to /DIN 68800-3/ to protect it against fungal decay and insect attacks.

As a general rule, constructive wood preservation in line with /DIN 68800-2/ is preferable.

Structural engineering data for binderholz BSH glulam

Designation	Values for	Unit
Wood types according to trade names under /EN 1912/	Spruce and fir	-
Wood moisture acc. to /EN 13183-2/	9 - 12	%
Use of wood preservatives (test ratings for the wood preservative according to /DIN 68800-3/)	Iv, P	-
Raw density of load-bearing elements according to /EN 338/ and /DIN 1052/, non load-bearing elements acc. to /DIN 68364/	459	kgs/m^3
Surface quality	Visible and non-visible quality	-
Width tolerance acc. to /EN 14080/	+/- 2	mm
Height tolerance acc. to /EN 14080/	+/- 2	mm
Length tolerance acc. to /EN 14080	+/- 0.1	%
Heat conductivity acc. to /ISO 1045	0.13	W/(mK)
Resistance to water vapour diffusion acc. to /ISO 10456/	40	-

The product performance values are those of the Performance Declaration in relation to its essential characteristics according to /EN 14080:2019-09/, Timber structures – Glue-laminated timber and laminated beams – Requirements.

2.4 Available dimensions and types

With the trimming options offered, binderholz BSH glulam can be provided in the following sizes up to lot size 1:

BSH Glulam Standard
Width range: 60 to 280 mm
Height range: up to 1,280 mm
Length range: 6.00 to 18.00 m

BSH Glulam Ceiling panels
Standard widths: 600 and 1000 mm, special width range 240 mm and up
Height and thickness range: 60 to 280 mm
Length range: 6.00 to 18.00 m

BSH Glulam Special elements
Width range: 120 to 480 mm
Height range: up to 2,000 mm
Length range: 6.00 to 32.5 m

2.5 Basic and auxiliary materials

Binderholz BSH glue-laminated timber is made from at least three grain-parallel softwood lamellae. Each lamella is first dried in a kiln and sorted for strength.

Two-component melamine urea formaldehyde glues (MUF glues) are used for finger jointing and surface bonding.

Binderholz BSH glue-laminated timber contains none of the substances on the /ECHA candidate list/ (status as of 15.01.2019) above 0.1% weight by weight. Binderholz BSH glue-laminated timber does 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 Regulations / (EU) No. 528/2012).

For the environmental product declaration, the following constituents are calculated per cubic metre of binderholz BSH glue-laminated timber:

- softwood: 88.58%
- Water: 10.7%
- MUF glue: 0.72%

Binderholz BSH glue-laminated timber has a calculated averaged raw density (u=12.08%) of 459.2 kgs/m³.

2.6 Manufacture

Binderholz BSH glue-laminated timber is manufactured in visible and non-visible qualities from spruce and fir.

Kiln-dried softwood lamellae with 9-14% wood moisture are used after mechanical sorting according to their strength and joined by finger-jointing to form practically endlessly long lamellae, which are then trimmed, planed and bonded to form glulam beams in accordance with the length ordered.

Finger jointing and surface bonding along the grain is carried out using the glue mentioned in chapter 2.5.

When the glue has cured completely, the timber surface is subjected to a final machining process and the custom-tailored trimming process.

Impregnation with wood preservatives is possible depending on the purpose for which binderholz BSH glulam is used.

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 BSH glue-laminated timber is 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 timber.

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 203 kgs of carbon are sequestered in one cubic metre of binderholz BSH glue-laminated timber, corresponding to approx. 745 kgs of CO_2 equivalent for complete oxidation.

2.11 Environmental and health issues during use

Environmental preservation: provided that binderholz BSH glue-laminated timber is used for the intended purposes, it does 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 BSH glue-laminated timber is a low-emission product due to the low glue content, its structure and application.
As mainly MUF glues are used, binderholz BSH glue-laminated timber emits formaldehydes in the range of 25µg/m³ (0.02 ppm). Compared to the limit value (0.1 ml/m³) these values are to be classified as low acc. to /EN 717-1/.

2.12 Reference useful life

Glulam has been used in the building industry for over a hundred years. Accordingly, no end to the durability of binderholz BHS glulam is known or to be expected if it is used according to its purpose.

Therefore, the useful life of binderholz BSH glue-laminated timber 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 BSH glue-laminated timber may result from its use according to the rules of engineering.

2.13 Exceptional impacts

Fire
Binderholz BSH glue-laminated timber is classified under material class D (/EN 13501-1/), 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 BSH glue-laminated timber, which therefore has a fracture pattern that is characteristic of solid wood.

2.14 End-of-life use

Due to its monolithic structure, binderholz BSH glue-laminated timber can be reused or used for other purposes without any problem if it is selectively dismantled.

If it cannot be reused as such, binderholz BSH glue-laminated timber can be used for generating process heat and electricity in thermal utilisation thanks to its high thermal value of approx. 19 MJ/kg. If used for energy generation, the requirements of the Bundes-Immissionsschutzgesetz (/BImSchG/) must be observed. Untreated binderholz glue-laminated timber is classified under waste class 17 02 01 according to the /AVV/ Annex III (Waste Wood Ordinance (waste wood V/) dated 15.02.2002. Waste code 17 02 04 applies for treated binderholz BSH glulam depending on the wood preservative used.

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 BSH glue-laminated timber, by taking account of the glue used acc. to Chapter 2.5 and a weight of 459.260 kgs/m³ at 12.08% wood moisture, which corresponds to a water portion of 10.7%, the glues correspond to a 0.72% 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	459.2	kgs/m^3
Wood moisture at delivery	12.08	%
Conversion factor to1 kg	0.0021777	-

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: drying of the sawn timber, trimming and lengthwise bonding, side-dressing, thickness bonding, planing to achieve a visually attractive surface, and packing of the products. Module A5 exclusively covers the disposal of the packing, which includes the output of the primary energy (PENRM) contained.
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	0.84	kgs
Other synthetic materials for thermal waste treatment	0.72	kgs
Overall efficiency of thermal utilisation of waste	44	%
Total exported electric energy	8.76	MJ
Total exported thermal energy	18.18	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	459.2	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)	394.95	kWh
Heat generated (per net flow of declared unit)	2877.48	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 394.95 kWh of electricity and 2877.48 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 glue-laminated timber

Para-meter	Unit	A1	A2	A3	A5	C2	C3	D
GWP	[kgs CO_2 eq.]	-6.60E+2	6.26E+0	1.44E+1	4.42E+0	5.36E-1	7.49E+2	-3.95E+2
ODP	[kgs CFC11 eq.]	1.58E-12	1.05E-15	6.59E-13	1.16E-15	8.99E-17	1.80E-13	-9.20E-12
AP	[kgs SO_2 eq.]	3.17E-1	2.64E-2	6.04E-2	6.73E-4	2.27E-3	6.64E-3	-3.61E-1
EP	[kgs $(PO_4)^{3-}$ eq.]	7.46E-2	6.73E-3	1.29E-2	8.89E-5	5.77E-4	1.08E-3	-5.61E-2
POCP	[kgs Ethene eq.]	1.99E-2	-1.09E-2	3.57E-2	3.05E-5	-9.36E-4	4.39E-4	-3.18E-2
ADPE	[kgs Sb eq.]	2.11E-5	4.89E-7	1.40E-5	1.42E-7	4.19E-8	1.80E-6	-9.38E-5
ADPF	[MJ]	1.04E+3	8.60E+1	2.39E+2	1.03E+0	7.38E+0	4.18E+1	-5.13E+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 metre of glue-laminated timber

Parameter	Unit	A1	A2	A3	A5	C2	C3	D
PERE	[MJ]	1.06E+3	5.01E+0	1.40E+3	2.14E-1	4.29E-1	2.96E+1	-1.51E+3
PERM	[MJ]	7.84E+3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-7.84E+3	0.00E+0
PERT	[MJ]	8.90E+3	5.01E+0	1.40E+3	2.14E-1	4.29E-1	-7.81E+3	-1.51E+3
PENRE	[MJ]	1.13E+3	8.63E+1	2.59E+2	5.73E+1	7.40E+0	5.49E+1	-5.76E+3
PENRM	[MJ]	4.38E+1	0.00E+0	5.62E+1	-5.62E+1	0.00E+0	-4.38E+1	0.00E+0
PENRT	[MJ]	1.17E+3	8.63E+1	3.15E+2	1.15E+0	7.40E+0	1.11E+1	-5.76E+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	7.84E+3
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.38E+1
FW	[m^3]	5.50E-1	8.47E-3	5.84E-1	1.01E-2	7.26E-4	1.60E-2	1.07E+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 of glue-laminated timber

Parameter	Unit	A1	A2	A3	A5	C2	C3	D
HWD	[kgs]	3.13E-5	4.82E-6	4.05E-6	5.11E-9	4.14E-7	4.26E-8	-3.27E-6
NHWD	[kgs]	9.83E-1	7.02E-3	8.99E-1	1.85E-1	6.02E-4	5.68E-2	2.84E+0
RWD	[kgs]	5.25E-2	1.17E-4	7.92E-3	4.59E-5	1.00E-5	5.17E-3	-2.65E-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	4.59E+2	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	0.00E+0	8.76E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	0.00E+0	1.82E+1	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. 863 kgs of CO_2enter the system as carbon stored in the biomass. Of this amount, 41kgs of CO_2 are emitted in the course of heat generation in the

upstream chains (Module A1). A further amount of 77 kgs of CO_2 is emitted to the atmosphere as a result of the wood combustion during the manufacturing process (Module A3). The amount of carbon finally stored in the glue-laminated timber is extracted from the system in the course of its reuse as waste wood.

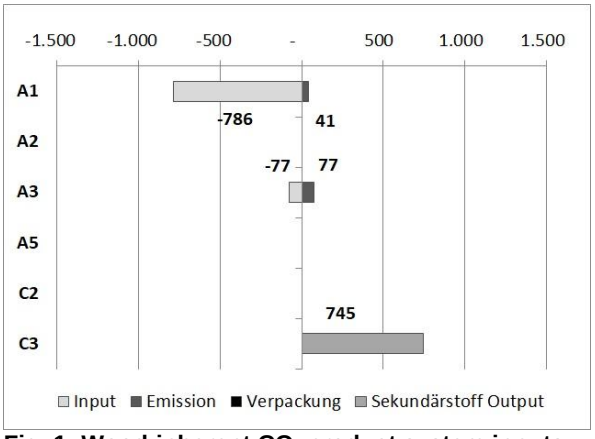


Fig. 1: Wood-inherent CO_2 product system inputs and outputs [kgs of CO_2 eq.]. The inverse signs given to the input and output take the ecological balance CO_2 flow consideration into account from the view of the atmosphere.

Due to the pronounced upstream chains and a high share of renewable energies in manufacture, the fossil global warming potential is distributed in the balance as follows: 80% for the provision of the semi-finished goods and raw materials (entire Module A1); 6% for the transport of the raw material (entire Module A2) and 14% for the manufacturing process of the glue-laminated timber (entire Module A3). Seen in detail, the provision of sawn timber - 75% (Module A1) - and the heat generation in the factory (Module A3), 13% 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, 69% is caused by the provision of the sawn timber (Module A1) and 19% by the energy consumption in the factory (Module A3).

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 12% to the AP (Module A3). The provision of semi-finished wood products as well as the firing for wood drying purposes account for 77% of the emissions with an acidification potential (Module A1). 6% is due to the transport of the semi-finished goods to the factory.

6.4 Eutrophication potential (EP)
75% of the total EP caused is due to upstream chain processes for the provision of the semi-finished wood products and a further 4% to the provision of the glues (both in Module A1). Transport of the semi-finished wood products to the factory contributes 7% (Module A2), while heat generation on site accounts for 11% of the EP (Module A3).

6.5 Photochemical ozone creation potential (POCP)
The main POCP contribution of 43% is due to the provision of the semi-finished wood products (Module A1), 67% to the emissions from wood drying in the factory (Module A3) and 11% to heat generation (also Module A3). The negative values (-24%) in the POCP in Module A2 enable the supposed excess of 100% and 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 (26%, Module A3), the upstream chain of semi-finished wood products (57%, Module A1) and the provision of the operating materials (12%, Module A3).

6.7 Abiotic depletion potential for fossil fuels (ADPF)
ADPF is also mainly distributed over Module A1 and is caused by the upstream chain of semi-finished wood products (67%) and provision of the glues (9%). In addition, heat generation in the factory accounts for approximately 17% 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), 20% in electric power consumption and 36% 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 69% in the upstream chain of semi-finished wood products (Module A1). In addition, roughly 8%of the PENRE is used for the provision of the glues in Module A1 and 16% for heat generation in the factory (Module A3).

6.10 Wastes:
In Module A1, special wastes are created by the provision of sawn timber (78%) and in Module A2, by the transport of the semi-finished goods (11%).

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. 2516444
Testing period: 27.09.2016 to 25.10.2016
Measuring method and results
The measurements according to /ISO 16000-9/ were uniformly carried out in test chambers at a temperature of 23°C, a relative air humidity of 50% and an air exchange rate of 0.50 per hour. The loading factor was 0.3 m²/m³.
The formaldehyde emission values analysed according to /EN 717-1/ and /ISO 16000-3/ are 0.02 ppm and are thus clearly below the limit value of E1 (0.1 ppm).

7.2 Toxicity of the combustion gases
The toxicity of the combustion gases from glue-laminated timber is equivalent to that of natural wood.

7.3 VOC emissions
Test site
Entwicklungs- und Prüflabor Holztechnologie GmbH.
Testing location
Zellescher Weg 24, 01217 Dresden.
Test report and testing period
Test report No. 2516444
Testing period: 27.09.2016 to 25.10.2016
Measuring method and results
The test in the testing chamber was carried out in accordance with /ISO 16000-9/. The VOC emissions were analysed according to /ISO 16000-6/.

AgBB results overview after 28 days

Results	Value	Unit
TVOC (C6 - C16)	47	µg/m³
Sum SVOC (C16 - C22)	Not detected	µg/m³
R (w/o dimension)	0.278	-
VOC w/o NIK	5	µg/m³

7 . Bibliographic references

/IBU 2016/
IBU (2016): General EPD programme –Programme guide of Institut Bauen und Umwelt e.V. (IBU). Version 1.1, Institut Bauen und Umwelt e.V., Berlin.
/ISO 14025/
DIN EN /ISO 14025:2011-10/, Environmental labels and declarations - Type III Environmental Declarations – Basics and Processes.

/EN 15804/
/EN 15804:2012-04+A1 2013/, Sustainability of buildings – Environmental Declarations – Product category rules (PCR) for construction products

/ISO 16000-3/
DIN ISO 16000-3:2013-01,
Indoor air — Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air — sampling method using a pump

/ISO 16000-6/
DIN ISO 16000-6:2012-11, Indoor air - Part 6: Determination of volatile organic compounds in indoor and test chamber air, sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS or MS-FID.

/ISO 16000-9/
DIN ISO 16000-9:2008-04, Indoor air Part 9: Determination of the emissions of volatile organic compounds from building products and furnishing – emission test chamber method.

/ISO 10456/
DIN EN ISO 10456:2010-05, Building materials and products — Hygrothermal properties — Tabulated design values and procedures for determining declared and design thermal values

/EN 16485/
DIN EN 16485:2014-07, logs and sawn timber - Environmental Declarations – Product category rules (PCR) for wood and wood-based products for use in construction

/EN 15425/
DIN EN 15425:2017-05, Adhesives - One component polyurethane (PUR) for load-bearing timber structures - Classification and performance requirements.

/EN 14080/
DIN EN 14080:2013-09, Timber structures - Glued laminated timber and glued solid timber - Requirements

/EN 13501-1/
DIN EN 13501-1:2010-01, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

/EN 13183-2/
DIN EN 13183-2:2002-07, Moisture content of a piece of sawn timber - Part 2: Estimation by electrical resistance method

/EN 1995-1-1/

DIN EN 1995-1-1:2010-12, Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings

/EN 1912/
DIN EN 1912:2013-10, structural timber – strength classes - assignment of visual grades and species

/EN 717-1/
DIN EN 717-1:2005-01, Wood-based panels - determination of the formaldehyde release – Part 1: Formaldehyde emission by the chamber method

EN 350/
Durability of wood and wood-based products – Testing and classification of the durability to biological agents of wood and wood-based materials.

/EN 338/
DIN EN 338:2016-07, Structural timber - Strength classes.

/EN 301/
DIN EN 301:2018-01, Adhesives, phenolic and aminoplastic, for load-bearing timber structures - Classification and performance requirements

/DIN 68800-1/
DIN 68800-1:2011-10, Wood preservation - Part 1: General.

/DIN 68800-2/
DIN 68800-2:2012-02, Wood preservation - Part 2: Preventive constructional measures in buildings.

/DIN 68800-3/
DIN 68800-3:2012-02, Wood preservation - Part 3: Preventive protection of wood with wood preservatives.

/DIN 68364/
DIN 68364:2003-05, Properties of wood species - Density, modulus of elasticity and strength.

/DIN 1052/
DIN 1052-10:2012-05, Design of timber structures - Part 10: Additional provisions

Further sources:

/AltholzV/
Waste Wood Ordinance (AltholzV): Ordinance on the requirements for the utilisation and removal of waste wood, 2017.

/AVV/
Waste List Ordinance (AVV) dated 10 December 2001 (Official Gazette I S. 3379), modified by Article 2 of the ordinance dated 17 July 2017 (Official Gazette S.2644).

/BImSchG/
Federal Pollution Control Act (BImSchG): Act for the protection against harmful environmental effects by air contamination, noise, vibrations and similar events, 2017.

/Biocidal products regulations
Regulation (EU) No. 528/2012 of the European Parliament and of the Council of 22 May 2012, concerning the making available on the market and use of biocidal products

/CML-IA/
CML-IA Version 2001-Apr. 2013: Characterisation factors for life cycle impact assessment.

/ECHA Candidate list/
List of substances of very high concern for authorisation (Status 15.01.2019) according to Article 59 para. 10 of REACH. European Chemicals Agency.

/Entwicklungs- und PrüflaborHolztechnologie GmbH/
Test report no. 2516444, 2016: results of the determination of VOC and formaldehyde emissions from Glulam acc. to the AgBB evaluation scheme, ISO 16000 parts 3, 6 and 9.

/GaBi Professional Datenbank 2019 Edition/
GaBi Professional Data Base 2019 Edition. Service Pack 39. thinkstep AG, 2019.

/GaBi ts/
GaBi ts Software Version 9.2.0.58: Software and database for integrated balancing. thinkstep AG, 2019.

/PCR for solid wood products/
Product category rules for building-related products and services. Part B: requirements concerning the environmental product declaration for solid-wood products, 2019-01. From the programme for environmental product declarations of the Institut Bauen und Umwelt e.V. (IBU).

/REACH regulation/
Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006, concerning the registration, evaluation, authorisation and restriction of chemicals (REACH). Latest modification dated 25.03.2014.

/Rüter, Diederichs 2012/
Rüter, S.; Diederichs, S., 2012: Ecological balance basis data for wood-based construction products: work report of the Institute for wood technology and wood biology.

Editor
Institut Bauen und Umwelt e.V.
Panoramastr.1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
E-Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Programme operator
Institut Bauen und Umwelt e.V.
Panoramastr.1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
E-Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Creator of the ecological balance
Thünen-Institut für Holzforschung
Leuschnerstr. 91
21031 Hamburg
Germany

Tel +49(0)40 73962 - 619
Fax +49(0)40 73962 - 699
E-Mail holzundklima@thuenen.de
Web **www.thuenen.de**

Declaration holder
Binderholz GmbH Glue-laminated timber factory
Zillertalstrasse 39
6263 Fügen
Austria

Tel +435288601
Fax +43528860111009
E-Mail christof.richter@binderholz.com
Web **www.binderholz.com**

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

epd-norge.no
The Norwegian EPD Foundation

Eier av deklarasjonen:	Moelven Limtre AS
Program operatør:	Næringslivets Stiftelse for Miljødeklarasjoner
Utgiver:	Næringslivets Stiftelse for Miljødeklarasjoner
Deklarasjon nummer:	NEPD-336-222-NO
Godkjent dato:	01.07.2015
Gyldig til:	01.07.2020

Standard limtrebjelke

Moelven Limtre AS

www.epd-norge.no

Generell informasjon

Produkt:
Standard limtrebjelke

Eier av deklarasjonen:
Moelven Limtre AS
Kontakt person: Kato Sveen
Tlf: +47 908 59 468
e-post: kato.sveen@moelven.no

Program operatør:
Næringslivets Stiftelse for Miljødeklarasjoner
Postboks 5250 Majorstuen, 0303 Oslo
Tlf: +47 23 08 82 92
e-post: post@epd-norge.no

Produsenter:

Moelven Limtre AS, Moelv	Moelven Limtre AS, Avd. Agder
Lundemovegen 1	Stasjonsveien 4
2391 Moelv	4730 Vatnestrøm
Norge	Norge

Deklarasjon nummer:
NEPD-336-222-NO

Produksjonssted:
Moelv, Norge
Vatnestrøm, Norge

ECO Platform registreringsnummer:

Kvalitet/Miljøsystem:
ISO 9001:2008, ISO 14001:2004, PEFC ST 2002:2013

Deklarasjonen er basert på PCR:
CEN Standard EN 15804 tjener som kjerne PCR
NPCR015 Wood and wood-based products for use in construction (08/2013)

Org. no.:
913 711 300

Erklæringen om ansvar:
Eieren av deklarasjonen skal være ansvarlig for den underliggende informasjon og bevis. EPD Norge skal ikke være ansvarlig med hensyn til produsent informasjon, livsløpsvurdering data og bevis.

Godkjent dato:
01.07.2015

Gyldig til:
01.07.2020

Deklarert enhet:
Produksjon av 1 m^3 standard limtrebjelke av gran eller furu

Årstall for studien:
2014-2015

Deklarert enhet med opsjon:

Sammenlignbarhet:
EPD av byggevarer er nødvendigvis ikke sammenlignbare hvis de ikke samsvarer med NS-EN 15804 og ses i en bygningskontekst.

Funksjonell enhet:
1 m^3 standard limtrebjelke av gran eller furu fra vugge-til-grav med en referanselevetid på 60 år.

Miljødeklarasjonen er utarbeidet av:
Lars G. F. Tellnes
Norsk Treteknisk Institutt

Verifikasjon:
Uavhengig verifikasjon av deklarasjonen og data, i henhold til ISO 14025:2010

internt	eksternt
☐	☑

Tredjeparts verifikator:
Helene Sedal
Helene Sedal, seniorrådgiver
(Uavhengig verifikator godkjent av EPD Norge)

Godkjent

Dagfinn Malnes
Daglig leder av EPD-Norge

Produkt

Produktbeskrivelse:
Limtre er oppbygd av trelameller som er sammenbundet med lim. Fiberretningen i lamellene går parallelt med bjelkens lengderetning. Bruksområde er takbjelker, kantbjelker, bjelkelag, sperrer, hallkonstruksjoner, bruer.

Tekniske data:
GL30c styrkeklassen. Produsert etter EN 14080:2013. Limtre har en densitet på 470 kg/m^3 og en fuktighet på 12%.

Produktspesifikasjon:
Lameltykkelsen er 45mm for standard dimensjoner. Bjelkens høyde er multipel av dette, f.eks. 225, 270, 315 osv. Spesialprodukter og buer med små radier kan/må produseres med andre lamelltykkelser.

Markedsområde:
Norge og Sverige

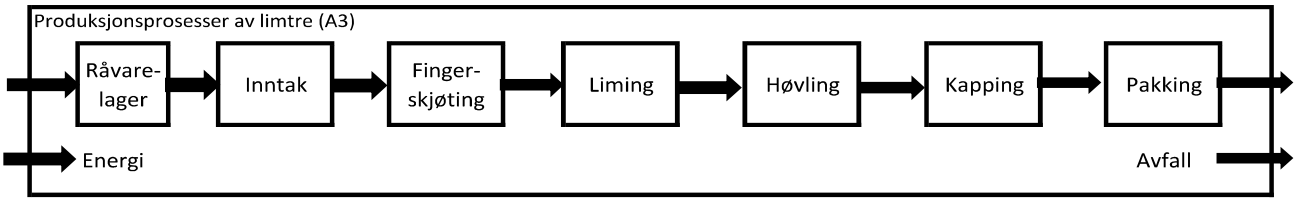
Levetid:
Referanselevetid er den samme som for byggverket, som regel settes denne til 60 år.

Materialer	kg	%
Høvellast av gran eller furu	461,22	98,13
Lim	8,78	1,87
Totalt for produktet	470	100,00
Plastemballasje	1	
Totalt med emballasje	471	

LCA: Beregningsregler

Deklarert enhet:
Produksjon av 1 m3 standard limtrebjelke av gran eller furu

Systemgrenser:
Flytskjema for produksjonen (A3) av limtre er vist under, mens resten av modulene er vist på side 5. Modul D er beregnet med energisubstitusjon og er nærmere forklart under scenarioene.



Datakvalitet:
Data for produksjonen av limtre ble hentet inn i 2014 og representerer et snitt for 2013. Data for skurlast et hentet fra norsk EPD med data representativt for 2013. Data for produksjon av lim er hentet fra de spesifikke leverandørene. Andre data er hentet fra Ecoinvent v3.1 som ble lansert i 2014. Data for fjernvarme er hentet fra Statistisk sentralbyrå og er representative for et gjennomsnitt i 2013.

Cut-off kriterier:
Alle viktige råmaterialer og all viktig energibruk er inkludert. Produksjonsprosessen for råmaterialene og energistrømmer som inngår med veldig små mengder (<1%) er ikke inkludert. Disse cut-off kriteriene gjelder ikke for farlige materialer og stoffer.

Allokering:
Allokering er gjort i henhold til bestemmelser i EN 15804. Inngående energi, vann, avfall og interntransport er allokert etter volum mellom alle produktene. Påvirkning for primærproduksjonen av resirkulerte materialer er allokert til hovedproduktet der materialet ble brukt. I verdikjeden av trevirke er det brukt økonomisk allokering.

Beregning av biogent karboninnhold:
Opptak og utslipp av karbondioksid fra biologisk opphav er beregnet basert på NS-EN 16485:2014. Denne metoden er basert på modularitetsprinsippet i EN 15804:2012, og hvor utslipp skal telles med i den livsløpsmodulen hvor det faktisk skjer. Mengden karbondioksid er beregnet i henhold til NS-EN 16449:2014. Med en gjennomsnittlig densitet på 461 kg/m^3 for limtre, så vil karboninnholdet omregnet til karbondioksid gi 755 kg CO_2 per m^3 trevirke.

Estimater og antakelser:
Nøkkelestimater og antakelser er enten presentert i EPD eller finnes i NPCR015 (08/2013).

LCA: Scenarier og annen teknisk informasjon

Følgende informasjon beskriver scenariene for modulene i EPDen.

Det er forutsatt en transport til byggeplass på 200 km, hvor 100 km skjer på stor lastebil og 100 km på en middels stor lastebil.

Transport fra produksjonssted til bruker (A4)

Type	Kapasitetsutnyttelse inkl. retur (%)	Kjøretøytype	Distanse km	Brennstoff/ Energiforbruk	Verdi (l/t)
Bil	53	EURO4, >32 tonn	100	0,02 l/tkm	2
Bil	26	EURO4, 16-32 tonn	100	0,045 l/tkm	4,5

I byggefasen er det antatt et behov for 1 MJ elektrisitet og at det blir 5 % svinn av produktet.

Produktet har emisjoner til innemiljø deklarert under inneklima, men ingen LCA-relatert miljøpåvirkning i bruk.

Byggefase (A5)

	Enhet	Verdi
Hjelpematerialer	kg	
Vannforbruk	m^3	
Elektrisitetsforbruk	MJ	1
Andre energikilder	MJ	
Materialtap	kg	23,5
Materialer fra avfallsbehandling	kg	
Støv i luften	kg	

Montert produkter i bruk (B1)

	Enhet	Verdi
Ingen LCA-relatert miljøpåvirkning i bruk		

Produktet krever normalt ingen vedlikehold eller reparasjon.

Produktet krever normalt ingen utskiftning i byggets levetid.

Vedlikehold (B2)/Reparasjon (B3)

	Enhet	Verdi
Vedlikeholdsfrekvens	År	
Hjelpematerialer	kg	
Andre ressurser	kg	
Vannforbruk	m^3	
Elektrisitetsforbruk	kWh	
Andre energikilder	MJ	
Materialtap	kg	

Utskifting (B4)/Renovering (B5)

	Enhet	Verdi
Utskiftingsfrekvens	År	60
Elektrisitetsforbruk	kWh	
Utskifting av slitte deler	0	

Produktet har ingen drifts energi og vannbruk

Limtre skal sorteres som blandet treavfall på byggeplass og behandles med energigjenvinning.

Drifts energi (B6) og vannbruk (B7)

	Enhet	Verdi
Vannforbruk	m^3	
Elektrisitetsforbruk	kWh	
Andre energikilder	MJ	
Utstyrets varmeeffekt	kW	

Sluttfase (C1, C3, C4)

	Enhet	Verdi
Farlig avfall	kg	
Blandet avfall	kg	
Gjenbruk	kg	
Resirkulering	kg	
Energigjenvinning	kg	470
Til deponi	kg	

Transporten av treavfall er basert på gjennomsnittsavstand for 2007 i Norge og utgjør 85 km (Raadal et al. (2009). Det er videre estimert at 36% av dette blir videre transportert til Sverige for behandling der. Det er estimert at 67% går på bil, 9% går på tog og 24% blir transportert på båt, mens transportavstandene er anslått.

Transport avfallsbehandling (C2)

Type	Kapasitetsutnyttelse inkl. retur (%)	Kjøretøytype	Distanse km	Brennstoff/ Energiforbruk	Verdi (l/t)
Bil		Uspesifisert	85	0,045 l/tkm	3,8
Bil	53	EURO4, >32t	200	0,019 l/tkm	3,8
Tog		Frakttog	400	- l/tkm	-
Båt		Pram	800	0,011 l/tkm	8,8

Gevinsten av eksportert energi fra energigjenvinning er beregnet med erstatning av norsk el-miks, norsk fjernvarmemiks, ulike former for industrielt brensel og eksport til Sverige. Data for el-miks er samme som brukt i A1-A3, fjernvarmemiks er basert på produksjonen i 2013, industrielt brensel er fra spesifikke produksjonssteder, mens generiske data fra ELCD er brukt for andelen som er eksportert til Sverige.

Gevinst og belastninger etter endt levetid (D)

	Enhet	Verdi
Erstatning av elektrisk energi	MJ	626
Erstatning av termisk energi	MJ	4643

LCA: Resultater

Resultatene for global oppvarming i A1-A3 gir store utslag for opptaket av karbondioksid gjennom fotosyntesen under trevirkets vekst. Den samme mengden karbondioksid slippes ut ved avfallsforbrenning i C3.

Systemgrenser (X = inkludert, MID = modul ikke deklarert, MIR = modul ikke relevant)

Produktfase			Konstruksjon installasjon fase		Bruksfase							Sluttfase				Etter endt levetid
Råmaterialer	Transport	Tilvirkning	Transport	Konstruksjon installasjon fase	Bruk	Vedlikehold	Reparasjon	Utskiftinger	Renovering	Operasjonell energibruk	Operasjonell vannbruk	Demontering	Transport	Avfallsbehandling	Avfall til sluttbehandling	Gjenbruk-gjenvinning-resirkulering-potensiale
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Miljøpåvirkning

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	B1-B7, C4	D
GWP	kg CO_2 -ekv	-6,63E+02	1,19E+01	7,11E+00	7,02E-03	9,31E+00	7,84E+02	0	-3,38E+02
ODP	kg CFC11-ekv	1,19E-05	2,20E-06	8,16E-07	6,09E-10	1,64E-06	5,89E-07	0	-5,14E-05
POCP	kg C_2H_4 -ekv	5,34E-02	2,05E-03	3,09E-03	1,87E-06	1,74E-03	4,69E-03	0	-8,63E-02
AP	kg SO_2 -ekv	7,43E-01	4,84E-02	4,82E-02	3,93E-05	5,01E-02	1,22E-01	0	-1,63E+00
EP	kg PO_4^{3-}-ekv	1,66E-01	8,13E-03	1,08E-02	8,77E-06	9,33E-03	3,20E-02	0	-1,15E-01
ADPM	kg Sb-ekv	2,72E-04	3,45E-05	1,72E-05	1,73E-07	2,36E-05	1,10E-05	0	-7,84E-05
ADPE	MJ	1,42E+03	1,82E+02	9,06E+01	6,29E-02	1,39E+02	7,46E+01	0	-2,43E+03

GWP Globalt oppvarmingspotensial; ODP Potensial for nedbryting av stratosfærisk ozon; POCP Potensial for fotokjemisk oksidantdanning; AP Forsurningspotensial for kilder på land og vann; EP Overgjødslingspotensial; ADPM Abiotisk uttømmingspotensial for ikke-fossile ressurser; ADPE Abiotisk uttømmingspotensial for fossile ressurser

Ressursbruk

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	B1-B7, C4	D
RPEE	MJ	3,22E+03	2,37E+00	5,58E+02	1,13E+00	2,27E+00	7,91E+03	0	-1,58E+03
RPEM	MJ	7,91E+03	INA	-1,22E-14	INA	INA	-7,91E+03	0	INA
TPE	MJ	1,11E+04	2,37E+00	5,58E+02	1,13E+00	2,27E+00	1,80E+00	0	-1,58E+03
NRPE	MJ	1,35E+03	1,83E+02	9,52E+01	8,99E-02	1,40E+02	2,26E+02	0	-4,41E+03
NRPM	MJ	1,56E+02	INA	-1,01E-16	INA	INA	-1,56E+02	0	INA
TRPE	MJ	1,51E+03	1,83E+02	9,52E+01	8,99E-02	1,40E+02	7,05E+01	0	-4,41E+03
SM	kg	INA	INA	INA	INA	INA	INA	0	INA
RSF	MJ	INA	INA	INA	INA	INA	INA	0	INA
NRSF	MJ	INA	INA	INA	INA	INA	INA	0	INA
W	m^3	2,03E+02	-3,16E-03	1,02E+01	8,51E-03	-1,51E-02	2,50E-01	0	-4,60E+00

RPEE Fornybar primærenergi brukt som energibærer; RPEM Fornybar primærenergi brukt som råmateriale; TPE Total bruk av fornybar primærenergi; NRPE Ikke fornybar primærenergi brukt som energibærer; NRPM Ikke fornybar primærenergi brukt som råmateriale; TRPE Total bruk av ikke fornybar primærenergi; SM Bruk av sekundære materialer; RSF Bruk av fornybart sekundære brensel; NRSF Bruk av ikke fornybart sekundære brensel; W Netto bruk av ferskvann

Livsløpets slutt - Avfall

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	B1-B7, C4	D
HW	kg	1,36E+00	4,95E-02	1,82E-01	1,83E-04	4,55E-02	2,19E+00	0	-6,21E-01
NHW	kg	3,33E+01	1,13E+01	2,90E+00	6,41E-03	7,89E+00	5,29E+00	0	-5,34E+00
RW	kg	4,01E-03	1,25E-03	3,19E-04	7,20E-07	9,39E-04	1,74E-04	0	-1,40E-02

HW Avhendet farlig avfall; NHW Avhendet ikke-farlig avfall; RW Avhendet radioaktivt avfall

Livsløpets slutt - Utgangsfaktorer

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	B1-B7, C4	D
CR	kg	INA	INA	INA	INA	INA	INA	0	INA
MR	kg	1,74E+00	INA	1,09E+00	INA	INA	INA	0	INA
MER	kg	8,00E-02	INA	4,00E-03	INA	INA	INA	0	INA
EEE	MJ	INA	INA	2,84E+01	INA	INA	5,68E+02	0	-6,26E+02
ETE	MJ	INA	INA	2,11E+02	INA	INA	4,21E+03	0	-4,64E+03

INA = Indikator er ikke vurdert

CR-komponenter for gjenbruk, MR Materialer for resirkulering, MER Materialer for energigjenvinning, EEE Eksportert elektrisk energi; ETE Eksportert termisk energi

Lese eksempel: 9,0 E-03 = $9,0*10^{-3}$ = 0,009

Norske tilleggskrav

Klimagassutslipp fra bruk av elektrisitet i produksjonsfasen
Nasjonal produksjonsmiks fra import, medium spenning (produksjon av overføringslinjer, i tillegg til direkte emissions tap i nettet) av anvendt elektrisitet for produksjonprosessen (A3).

Data kilde	Mengde	Enhet
Econinvent v3.1 (june 2014)	22,8	gram CO_2-ekv/kWh

Farlige stoffer

- ☐ Produktet inneholder ingen stoffer fra REACH Kandidatliste eller den norske prioritetslisten
- ☑ Produktet inneholde stoffer som er under 0,1 vekt% på REACH Kandidatliste
- ☐ Produktet inneholde stoffer fra REACH Kandidatliste eller den norske prioritetslisten, se tabell under Spesifikke norske krav.
- ☐ Produktet inneholder ingen stoffer på REACH Kandidatliste eller den norske prioritetslisten. Produktet kan karakteriseres som farlig avfall (etter Avfallsforskiften, Vedlegg III), se tabell under Spesifikke norske krav.

Transport
Transport fra produksjonssted til byggeplass i Norge i henhold til scenario i A4: 200 km

Inneklima
Limtrebjelk av gran har blitt testet for emisjoner av totalt flykte oragniske forbindelser (TVOC), formaldehyd og ammoniakk. Resultatene etter 28 dager viser en emisjonshastighet på 0.04 mg/m^{2}h for TVOC, <0.033 mg/m^{2}h for formaldehyd og <0.005 mg/m^{2}h. I følge den finske innklimaklassifiseringen av byggematerialer fra Rakennustieto, så vil dette ligge i klassen M1. Resultatene har også blitt vurdert til å oppfylle kravene til E1 i NS-EN 717-1:2004 med en beregnet formaldehydemisjon på <0.009 mg/m^3. Dokumentasjon av testresultater kan fås på forespørsel til Moelven limtre AS.

Klimadeklarasjon
Det er ikke utarbeidet klimadeklarasjon for produktet.

Bibliografi

NS-EN ISO 14025:2010	*Miljømerker og deklarasjoner - Miljødeklarasjoner type III - Prinsipper og prosedyrer.*
NS-EN ISO 14044:2006	*Miljøstyring - Livsløpsvurderinger - Krav og retningslinjer*
NS-EN 15804:2012+A1:2013	*Bærekraftig byggverk - Miljødeklarasjoner - Grunnleggende produktkategoriregler for byggevarer*
ISO 21930:2007	*Sustainability in building construction - Environmental declaration of building products*
Tellnes, L. G. F. (2015)	*LCA-report for Moelven Limtre AS. Report nr. 310484-1 from Norwegian Institute of Wood Technology, Oslo, Norway*
NPCR015 rev1	*Product category rules for wood and wood-based products for use in construction*
Ecoinvent v3.1	*Swiss Centre of Life Cycle Inventories. www.ecoinvent.ch*
ELCD 3.0	*European reference Life-Cycle Database. Http://eplca.jrc.ec.europa.eu/*
Statistisk sentralbyrå	*Tabell 04727: Fjernvarmebalansen*
Statistisk sentralbyrå	*Tabell 09469: Nettoproduksjon av fjernvarme*
NS-EN 16449:2014	*Tre og trebaserte produkter - Beregning av biogent karboninnhold i tre og omdanning til karbondioksid*
NS-EN 16485:2014	*Tømmer og skurlast - Miljødeklarasjoner - Produktkategoriregler for tre og trebaserte produkter til bruk i byggverk*
NS-EN 14080:2013	*Trekonstruksjoner - Limtre og limt laminert heltre - Krav*
Raadal et al. (2009).	*Raadal, H. L., Modahl, I. S. & Lyng, K-A. (2009). Klimaregnskap for avfallshåndtering, Fase I og II. Oppdragsrapport nr 18.09 fra Østfoldforskning, Norge*
Rakennustieto	*Emission Classification of Building Materials. The Building Information Foundation RTS (Rakennustieto). Helsinki, Finland.*
NS-EN 717-1:2004	*Trebaserte platematerialer - Bestemmelse av formaldehydutslipp - Del 1: Formaldehydutslipp ved kammermetode*

epd-norge.no The Norwegian EPD Foundation	**Program operatør og utgiver** Næringslivets Stiftelse for Miljødeklarasjoner Postboks 5250 Majorstuen, 0303 Oslo Norge	Tlf: e-post: web	+47 23 08 82 92 post@epd-norge.no www.epd-norge.no
MOELVEN	**Eier av deklarasjonen** Moelven Limtre AS Postboks 143, 2391 Moelv Norge	Tlf: Fax e-post: web	+47 62 33 40 00 +47 62 33 40 01 post.limtre@moelven.no www.moelven.no
Treteknisk	**Forfatter av Livssyklusrapporten** Lars G. F. Tellnes Norsk Treteknisk Institutt Postboks 113 Blindern, 0314 Oslo, Norge	Tlf: Fax e-post: web	+47 98 85 33 33 firmapost@treteknisk.no www.treteknisk.no