



## **Environmental product information for LEED v4.1<sup>®</sup> building certification**

**Glued laminated timber, glued solid timber,  
block glued glulam and special components  
according to EN 14080**

Company	HASSLACHER Group
Website	<a href="http://www.hasslacher.com">www.hasslacher.com</a>
Address	Feistritz 1, 9751 Sachsenburg, Austria
Contact	DI Georg Jeitler
E-Mail	<a href="mailto:info@hasslacher.com">info@hasslacher.com</a>
Phone	+43 (0) 4769 22 49 0
Date	June 2022
<b>Author</b>	<b>Daxner &amp; Merl GmbH</b>

This document aims at the identification of linkages between environmental product information covered by EPDs and the requirements of the LEED v4.1® building certification. It provides an overview of product related features based on the LEED v4.1 credit library [[www.usgbc.org/credits](http://www.usgbc.org/credits), accessed on 05/2022, LEED BD+C: New Construction v4.1]

## .product description

Glued laminated timber (the term also includes glued solid timber, block glued glulam and special components throughout this document) from HASSLACHER Group is a solid, rod-shaped timber element consisting of at least two dried softwood lamellas bonded parallel to the fibres. The glued laminated timber is manufactured according to *EN 14080*.

## .application

Glued laminated timber is used in all structural areas of modern timber construction, i.e. from engineering-based residential and industrial construction to bridge building.

## .technical data

Structural data for glued laminated timber according to *EN 14080* are given. The products are being delivered to the market with the appropriate CE mark and Declaration of Performance.

Name	Value	Unit
Wood species according to <i>EN 1912</i> and letter codes, if any, in accordance with <i>EN 13556</i>	PCAB (Norway spruce) ABAL (Silver fir) PNSY (Scots pine) LADC (Europ. Larch)	
Mean humidity acc. to <i>EN 13183-1</i>	12 ± 2	%
Use of wood preservatives (the test rating of the wood preservative according to <i>DIN 68800-3</i> must be stated) <sup>1)</sup>	Iv, P and W	-
Characteristic value of compressive strength parallel to grain acc. to <i>EN 14080</i>	18.5 - 36	N/mm <sup>2</sup>
Characteristic value of compressive strength perpendicular to grain acc. to <i>EN 14080</i>	2.5	N/mm <sup>2</sup>
Characteristic value of tensile strength parallel to grain acc. to <i>EN 14080</i>	15 – 28.8	N/mm <sup>2</sup>
Characteristic value of tensile strength perpendicular to grain acc. to <i>EN 14080</i>	0.5	N/mm <sup>2</sup>
Mean value of modulus of elasticity parallel to grain acc. to <i>EN 14080</i>	10400 – 15750	N/mm <sup>2</sup>
Characteristic value of shear strength acc. to <i>EN 14080</i>	3.5	N/mm <sup>2</sup>
Mean value of shear modulus acc. to <i>EN 14080</i>	650	N/mm <sup>2</sup>
Dimensional deviation acc. to <i>EN 14080</i>	Width: +/- 2 mm; Heights (< 400 mm): + 4 mm /- 2 mm; Heights (> 400 mm): 1 % /- 0,5 %; Lengths (< 2 m): +/- 2 mm; Lengths (> 2 m /< 20 m): +/- 0,1 %; Lengths (> 20 m): +/- 20 mm	mm or %
Average raw density of load-bearing elements acc. to <i>EN 14080</i>	470	kg/m <sup>3</sup>
Surface quality	Visual quality, industrial visual quality	-
Thermal conductivity (perpendicular to grain) acc. to <i>ISO 10456</i>	0.12	W/(mK)
Specific heat capacity acc. to <i>ISO 10456</i>	1600	J/(kgK)
Water vapour diffusion resistance factor acc. to <i>ISO 10456</i>	μ = 50 (dry) to 20 (wet)	-

<sup>1)</sup> According to *DIN 68800-1*, wood preservative treatment is only permissible if structural measures have been exhausted and is therefore unusual.

**.environmental product declaration**

Owner of the declaration	HASSLACHER Holding GmbH
Programme holder & publisher	Institut Bauen und Umwelt e.V. (IBU)
ECO-EPD at ECO platform	yes
Author of the LCA	Daxner & Merl GmbH
Software & database	GaBi software-system and database for life cycle engineering GaBi 10, database 2020.2 [ <a href="#">see documentation</a> ]
Third-party verification	Completed; Type III declaration in compliance with <i>ISO 14025</i>
External verifier	Matthias Klingler
Declaration number	EPD-HAS-20210171-IBD1-EN (Glued laminated timber, glued solid timber, block glued glulam and special components according to <i>EN 14080</i> )
Issue date	10.09.2021
Valid to	02.08.2026
Declaration type	Manufacturer's declaration of an average product according to <i>EN 15804</i>
EPD specifications	The EPD was created according to the specifications of <i>EN 15804+A2</i>
Declared unit	1 m <sup>3</sup> HASSLACHER glued laminated timber with an average density of 470 kg/m <sup>3</sup> at 13 % moisture at delivery, manufactured by the HASSLACHER group at the following production sites: <ul style="list-style-type: none"><li>- NORITEC Holzindustrie GmbH in Sachsenburg (Austria),</li><li>- HASSLACHER Holzbausysteme GmbH in Hermagor (Austria),</li><li>- HASSLACHER Holzbauteile GmbH &amp; Co. KG in Kleinheubach (Germany) and</li><li>- NORDLAM GmbH in Magdeburg (Germany).</li></ul>
Conversion factor [mass/declared unit]	HASSLACHER glued laminated timber: 470
Reference period	Glued laminated timber has been used for over 100 years. When used as intended, no end to its durability is known or to be expected. The service life of glued laminated timber is therefore the same as the service life of the building when used as intended.
End of life scenario	The product reaches the end of its waste status after removal from the building, transport to processing and chipping of the product. For the end of life of the HASSLACHER solid wood products, energy recovery as secondary fuel in a biomass power plant is assumed. As the main sales market for HASSLACHER products is concentrated in the European region, plant-specific characteristic values correspond to a European average scenario (EU28). The scenario considers a reprocessing rate of 100 % for the solid wood products after removal from the building. This assumption has to be adjusted accordingly when applying the results in the building context. At the end-of-life of the product, the equilibrium moisture is comparable to the moisture content at delivery. This value can vary depending on the storage of the product before energy recovery.

**.results of the LCA – environmental impacts acc. to EN 15804+A2**

Declared unit: 1m <sup>3</sup> glued laminated timber (470 kg/m <sup>3</sup> )							
Declared life cycle stage		Product stage		End of life stage			Benefits and loads beyond the system boundary
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	[kg CO <sub>2</sub> -eq.]	-6.08E+02	0.00E+00	1.42E+00	7.53E+02	0.00E+00	-4.10E+02
GWP-fossil	[kg CO <sub>2</sub> -eq.]	1.44E+02	0.00E+00	1.41E+00	3.74E+00	0.00E+00	-4.08E+02
GWP-biogenic	[kg CO <sub>2</sub> -eq.]	-7.53E+02	0.00E+00	-1.67E-03	7.50E+02	0.00E+00	-1.42E+00
GWP-luluc	[kg CO <sub>2</sub> -eq.]	7.81E-01	0.00E+00	1.15E-02	5.29E-03	0.00E+00	-3.19E-01
ODP	[kg CFC11-eq.]	6.84E-08	0.00E+00	2.77E-16	8.95E-14	0.00E+00	-5.32E-12
AP	[mol H <sup>+</sup> - eq.]	6.67E-01	0.00E+00	4.66E-03	7.78E-03	0.00E+00	3.05E-01
EP-freshwater <sup>1</sup>	[kg P- eq.]	1.64E-03	0.00E+00	4.17E-06	1.00E-05	0.00E+00	-6.05E-04
EP-marine	[kg N- eq.]	2.95E-01	0.00E+00	2.14E-03	1.85E-03	0.00E+00	5.77E-02
EP-terrestrial	[mol N- eq.]	3.01E+00	0.00E+00	2.39E-02	1.94E-02	0.00E+00	6.98E-01
POCP	[kg NMVOC-eq.]	8.47E-01	0.00E+00	4.20E-03	5.01E-03	0.00E+00	2.62E-01
ADPE	[kg Sb-eq.]	3.81E-05	0.00E+00	1.25E-07	1.10E-06	0.00E+00	-7.47E-05
ADPF	[MJ]	2.09E+03	0.00E+00	1.87E+01	6.65E+01	0.00E+00	-7.17E+03
WDP	[m <sup>3</sup> World- eq. deprived]	1.17E+01	0.00E+00	1.30E-02	6.00E-01	0.00E+00	-1.05E+01

**Caption**

GWP – total = Global warming potential – total; GWP-fossil - Global warming potential - fossil fuels; GWP-biogenic - Global warming potential – biogenic; GWP-luluc - GWP from land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential; accumulated exceedance; EP-freshwater - Eutrophication, fraction of nutrients reaching freshwater end compartment; EP-marine - Eutrophication, fraction of nutrients reaching marine end compartment; EP-terrestrial - Eutrophication, accumulated exceedance; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE - Abiotic depletion potential for non-fossil resources; ADPF - Abiotic depletion potential for fossil resources; WDP - Water (user) deprivation potential, deprivation-weighted water consumption (WDP)

<sup>1</sup> Disclaimer: This indicator has been calculated as [kg P-equiv.] according to the characterization model of the JRC and Environmental Footprint Initiative.

**.results of the LCA – resource use acc. to EN 15804+A2**

Declared unit: 1m <sup>3</sup> glued laminated timber (470 kg/m <sup>3</sup> )							
Declared life cycle stage		Product stage		End of life stage			Benefits and loads beyond the system boundary
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	[MJ]	1.70E+03	0.00E+00	1.08E+00	7.68E+03	0.00E+00	-1.83E+03
PERM	[MJ]	7.66E+03	0.00E+00	0.00E+00	-7.65E+03	0.00E+00	0.00E+00
PERT	[MJ]	9.36E+03	0.00E+00	1.08E+00	3.06E+01	0.00E+00	-1.83E+03
PENRE	[MJ]	2.00E+03	0.00E+00	1.88E+01	6.65E+01	0.00E+00	-7.17E+03
PENRM	[MJ]	8.51E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	[MJ]	2.09E+03	0.00E+00	1.88E+01	6.65E+01	0.00E+00	-7.17E+03
SM	[kg]	3.02E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.65E+03
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	[m <sup>3</sup> ]	8.04E-01	0.00E+00	1.23E-03	2.98E-02	0.00E+00	-1.20E+00

**Caption**

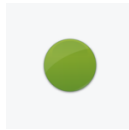
PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable 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 acc. to EN 15804+A2**

Declared unit: 1m <sup>3</sup> glued laminated timber (470 kg/m <sup>3</sup> )							
Declared life cycle stage		Product stage		End of life stage			Benefits and loads beyond the system boundary
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
HWD	[kg]	1.98E-06	0.00E+00	9.90E-10	1.76E-08	0.00E+00	-1.61E-06
NHWD	[kg]	1.99E+00	0.00E+00	2.95E-03	4.72E-02	0.00E+00	2.72E-01
RWD	[kg]	7.30E-02	0.00E+00	3.41E-05	9.90E-03	0.00E+00	-5.89E-01
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	4.70E+02	0.00E+00	0.00E+00
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**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 energy, electric energy, EET = Exported energy, thermal energy

**.LEED v4.1 credits with regard to environmental product information**

LEED BD+C: New Construction v4.1 - LEED v4.1  
Construction and Demolition Waste Management  
Materials and Resources  
Possible 2 Points

**Intent**

To reduce construction and demolition waste disposed of in landfills and incineration facilities through waste prevention and by reusing, recovering, and recycling materials, and conserving resources for future generations. To delay the need for new landfill facilities that are often located in frontline communities and create green jobs and materials markets for building construction services.

**Option 1: Diversion**

HASSLACHER glued laminated timber represents a suitable target for diversion of resources from landfill. Applying re-use and recycling according to chapter 2.14.

**Option 2. Waste Prevention**

HASSLACHER glued laminated timber including packaging materials can be separately collected and re-used or recycled.

Sections 2.8 and 2.9 of the environmental product declaration of HASSLACHER glued laminated timber present details for the product's construction phase. In addition, section 2.14 indicates details for the product's re-use phase. Referring information are compliant with the intent to promote resource efficiency via the effective and appropriate management of construction waste. Aspects described in the EPD should be considered:

**EPD | chapter 2.8 | product processing/installation**

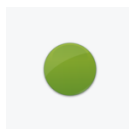
Glued laminated timber can be processed with suitable tools commonly used in solid timber processing. On request, products can also be processed on both sides in the factory and provided with fasteners or (glued-in) steel parts. Occupational safety instructions must also be observed during processing/assembly.

**EPD | chapter 2.9 | packaging**

Polyethylene, solid timber, paper and cardboard as well as small amounts of other plastics are used.

**EPD | chapter 2.14 | re-use phase**

In the case of selective deconstruction, glued laminated timber can be reused or reutilised without any problems after the end of the utilisation phase in the sense of cascading utilisation ("reuse"). If it is not possible to reuse or reutilise glued laminated timber, it can be thermally recycled to generate process heat and electricity due to its high calorific value of approx. 19 MJ/kg.



LEED BD+C: New Construction v4.1 - LEED v4.1  
Building Life-Cycle Impact Reduction  
Materials and Resources  
Possible 5 Points

**Intent**

To encourage adaptive reuse and optimize the environmental performance of products and materials.

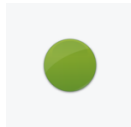
**Option 1. Building and material reuse**

According to Option 1, Path 1 HASSLACHER products can be included in the calculation of the percentage of existing building structural elements reused or salvaged. Building materials such as structural elements (walls-, ceilings-, roofs- and envelope constructions) or installed interior elements shall explicitly be included in the calculation.

**Attention:** Reuse materials contributing toward this credit may not contribute toward MR credit-Sourcing of Raw Materials!

#### Option 2. Whole-building life-cycle assessment

The environmental product declaration presents product specific values, which can directly be used for the life cycle assessment of the whole project. Given results are compliant with *ISO 14044* (and *EN 15804*) and report all listed impact categories.



LEED BD+C: New Construction v4.1 - LEED v4.1  
Environmental Product Declarations  
Materials and Resources  
Possible 2 Points

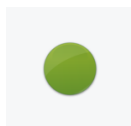
#### Intent

To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products from manufacturers who have verified improved environmental life-cycle impacts.

#### Option 1. environmental product declaration

HASSLACHER glued laminated timber meets the following disclosure criteria:

- Environmental product declaration which complies with *ISO 14025*, *14040*, *14044* and *EN 15804+A2* with a cradle-to-gate scope with modules (Module A1-A3, Modules C1-C4 and Module D declared).
- Product-specific Type III EPD - Products with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator are valued as one whole product for purposes of credit achievement calculation.



LEED BD+C: New Construction v4.1 - LEED v4.1  
Sourcing of Raw Materials  
Materials and Resources  
Possible 2 Points

#### Intent

To encourage the use of products and materials for which life cycle information is available and that have environmentally, economically, and socially preferable life cycle impacts. To reward project teams for selecting products verified to have been extracted or sourced in a responsible manner.

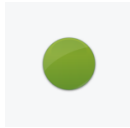
Product information for HASSLACHER glued laminated timber within this credit:

Responsible sourcing of raw materials		Description
Wood products certified by Forest Stewardship Council or USGBC-approved equivalent	yes	<p><b>Site Kleinheubach (Germany):</b> Forest Stewardship Council (FSC) Certificate Number <a href="#">TUEV-COC-000166</a> (Chain-of-Custody) Date of issuance: 2018-06-08 Valid to: 2023-06-07</p> <p>Programme for the Endorsement of Forest Certification Schemes (PEFC) Certificate Registration Number <a href="#">44 702 107269</a> (Chain-of-Custody) Date of first issuance: 2011 Date of issuance: 2018-06-08 Valid to: 2023-06-07</p> <p><b>Site Magdeburg (Germany):</b> Programme for the Endorsement of Forest Certification Schemes (PEFC) Certificate Number <a href="#">DC-COC-000310</a> (Chain-of-Custody) Date of issuance: 01.08.2018 Valid to: 28.02.2023</p> <p><b>Sites Sachsenburg and Hermagor (both Austria):</b> Programme for the Endorsement of Forest Certification Schemes (PEFC) Certificate Number <a href="#">HFA-COC-0209</a> (Multisite) Date of first issuance: 21.06.2001 Date of issuance: 01.12.2021 Valid to: 30.06.2025</p>
Recycled content element		No secondary wood is used to produce HASSLACHER glued laminated timber.

The production of HASSLACHER glued laminated timber takes place in the following production sites:

- NORITEC Holzindustrie GmbH in Sachsenburg (Austria),
- HASSLACHER Holzbausysteme GmbH in Hermagor (Austria),
- HASSLACHER Holzbauteile GmbH & Co. KG in Kleinheubach (Germany) and
- NORDLAM GmbH in Magdeburg (Germany).





LEED BD+C: New Construction v4.1 - LEED v4.1  
Material Ingredients  
Materials and Resources  
Possible 2 Points

**Intent**

To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. To reward raw material manufacturers who produce products verified to have improved life-cycle impacts.

Product information for HASSLACHER glued laminated timber within this credit:

**Option 2.****Material ingredient optimization**

International Alternative Compliance Path – REACH Optimization	All ingredients comply with REACH requirements (date 19.01.2021), no other cancerogenic, mutagenic, reprotoxic (CMR) substances of category 1A or 1B that are on the ECHA candidate list, above 0.1 % by mass, see EPD section 2.5
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Download area for product data sheets: [www.hasslacher.com/downloads](http://www.hasslacher.com/downloads)

Additional useful information regarding this credit, see EPD chapter 2.11 and 7:

**Environmental protection:** According to the current state of knowledge, hazards to water, air and soil cannot arise if the products are used as intended.

**Health protection:** According to the current state of knowledge, no health hazards or impairments are to be expected.

With regard to formaldehyde, glued laminated timber is low in emissions due to its low adhesive content, its structure and its form of use (formaldehyde emission class E1).

Glued laminated timber bonded using MUF adhesives subsequently releases formaldehyde; with regard to the limit value of < 0.1 ppm HCOO/m<sup>2</sup> air of formaldehyde emission class E1, the measured test values of < 0.01 ppm HCHO/m<sup>3</sup> air can be categorised as low and are at the detectability limit of state-of-the-art measurement methods. MUF adhesives themselves do not contain MDI.

According to the Holz Forschung Austria VOC emission test report acc. to *EN 16516* (number: 1096/2021-HC, 18.05.2021) the product fulfils the following standards and labels:

- the *AgBB* (Committee for health-related evaluation of building products) schema



LEED BD+C: New Construction v4.1 - LEED v4.1  
Low-Emitting Materials  
Indoor Environmental Quality  
Possible 3 Points

**Intent**

To reduce concentrations of chemical contaminants that can damage air quality and the environment, and to protect the health, productivity, and comfort of installers and building occupants.

Product information for HASSLACHER glued laminated timber within this credit:

Item	Value	Unit
Test Institute	Holzforschung Austria – Österreichische Gesellschaft für Holzforschung	-
Report no.	1096/2021-HC	-
Test method	Measurement of the emissions of a sample with respect to VOC, formaldehyde and short-chain carbonyl compounds according to <i>EN 16516</i>	-
Relevant regulation	<i>AgBB, EN 16516</i>	-
Requirements met	yes	-
TVOC (C6 C16) (substance spec.) [28 days]	184	µg/m <sup>3</sup>
TVOC (Toluene eq.) [28 days]	160	µg/m <sup>3</sup>
R (dimensionless) [28 days]	0.14	-
Formaldehyde [28 days]	4.4	µg/m <sup>3</sup>
TVOC (C6 C16) (substance spec.) [3 days]	181	µg/m <sup>3</sup>
TVOC (Toluene eq.) [3 days]	170	µg/m <sup>3</sup>
Formaldehyde [3 days]	7.3	µg/m <sup>3</sup>

According to the Holz Forschung Austria VOC emission test report acc. to *EN 16516* (number: 1096/2021-HC, 18.05.2021) the product fulfils the following standards and labels:

- the *AgBB* (Committee for health-related evaluation of building products) schema

EPD chapter 2.11 Environment and health during use: With regard to formaldehyde, glued laminated timber is low in emissions due to its low adhesive content, its structure and its form of use (formaldehyde emission class E1).

Glued laminated timber bonded using MUF adhesives subsequently releases formaldehyde; with regard to the limit value of < 0.1 ppm HCOO/m<sup>2</sup> air of formaldehyde emission class E1, the measured test values of < 0.01 ppm HCHO/m<sup>3</sup> air can be categorised as low and are at the detectability limit of state-of-the-art measurement methods. MUF adhesives themselves do not contain MDI.

For further information see LEED credit Material Ingredients, Materials and Resources.

Disclaimer: The content of, and results shown in this fact sheet are based on data and information submitted by the client. Therefore, Daxner & Merl GmbH makes no representation or warranty in regard of the correctness or completeness of the content of this document or the results shown.

## .References

AgBB, board for the health evaluation of building products, German Federal Environmental Agency, Wörlitzer Platz 1, 06844 Dessau-Roßlau.

DIN 68800-1:2019-06, Wood preservation – Part 1: General. Wood preservation – Part 2: Preventive constructional measures in buildings.

DIN 68800-3:2020-03, Wood preservation – Part 3: Preventive protection of wood with wood preservatives.

ECHA Candidate List: List of substances of very high concern considered for approval (status 19.01.2021) according to Article 59 para. 10 of the REACH Regulation. European Chemicals Agency.

EN 1912: ÖNORM EN 1912:2013-10-15, Structural timber – Strength classes – Assignment of visual grades and species.

EN 13183-1: ÖNORM EN 13183-1:2004-02-01, Moisture content of a piece of sawn timber – Part 1: Determination by oven dry method.

EN 13556: ÖNORM EN 13556:2003-09-01, Round and sawn timber. Nomenclature of timbers used in Europe.

EN 14080: ÖNORM EN 14080:20130801, Timber structures – glued laminated timber and glued solid timber – Requirements.

EN 15804: DIN EN 15804:2012+A2:2019, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

EN 16516: DIN EN 16516:2020-10, Construction products: Assessment of release of dangerous substances – Determination of emissions into indoor air.

EPD (2021), EPD-HAS-20210171-IBD1-EN, Glued laminated timber, glued solid timber, block glued glulam and special components according to *EN 14080*, HASSLACHER Holding GmbH, Institut Bauen und Umwelt e.V. (IBU), 2021.

FSC-certificate, Kleinheubach: Forest Stewardship Council (FSC). Certificate Number [TUEV-COC-000166](#) (Chain-of-Custody). Date of issuance: 2018-06-08, Valid to: 2023-06-07.

GaBi: GaBi 10, Software-System and Database for Life Cycle Engineering. DB 2020.2. Stuttgart, Echterdingen: Sphera, 1992-2020. Available at: <https://gabi.sphera.com/support/gabi>.

Holz Forschung Austria: Holz Forschung Austria, VOC emission test report acc. to EN 16516 (18.05.2021), number: 1096/2021-HC

ISO 10456: ÖNORM EN ISO 10456:2010-02-15, Building materials and products Hygrothermal properties Tabulated design values and procedures for determining declared and design thermal values.

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

ISO 14040:2006-07, Environmental management – Life cycle assessment – Principles and framework.

ISO 14044: DIN EN ISO 14044:2006-10: Environmental Management – Life Cycle Assessment – Requirements and Guidelines.

PEFC-certificate, Sachsenburg and Hermagor: Programme for the Endorsement of Forest Certification Schemes (PEFC). Certificate No.: [HFA-COC-0209](#) (Multisite). Date of first issuance: 21.06.2001; Date of issuance: 01.07.2020; Valid to: 30.06.2025.

PEFC-certificate, Kleinheubach: Programme for the Endorsement of Forest Certification Schemes (PEFC). Certificate Registration Number [44 702 107269](#) (Chain-of-Custody). Date of first issuance: 2011; Date of issuance: 2018-06-08; Valid to: 2023-06-07.

PEFC-certificate, Magdeburg: Programme for the Endorsement of Forest Certification Schemes (PEFC). Certificate Number [DC-COC-000310](#) (Chain-of-Custody). Date of issuance: 01.08.2018; Valid to: 28.02.2023.

U.S. Green Building Council, 2018. LEED v4.1 for Building Design and Construction.