ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Mayr-Melnhof Holz Holding AG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Issue date	09.04.2024
Valid to	08.04.2029

Cross-laminated timber

Mayr-Melnhof Holz Holding AG

Institut Bauen und Umwelt e.V.

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1. General Information

Mayr-Melnhof Holz Holding AG

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-MAY-20240070-IBA1-EN

This declaration is based on the product category rules:

Solid wood products, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

09.04.2024

Valid to

08.04.2029

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

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

Cross-laminated timber

Owner of the declaration

Mayr-Melnhof Holz Holding AG
Turmgasse 67
8700 Leoben
Austria

Declared product / declared unit

1 m³ cross-laminated timber with an average density of 470 kg/m³ (moisture at delivery = 11.5 %).

Scope:

This EPD is based on a declared unit of 1 m³ of cross-laminated timber (moisture of 11.5 % at a raw density of 470 kg/m³), produced at the Mayr-Melnhof Holz Holding AG production site at Gaishorn (Austria).

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Matthias Schulz,
(Independent verifier)

2. Product

2.1 Product description/Product definition

MM-crosslam (cross-laminated timber, abbreviated as CLT or X-lam) is an industrially manufactured plane timber product for structural applications. It is used as panel or diaphragm elements and more seldomly as beams.
MM-crosslam generally displays a symmetrical design and comprises at least three layers glued at right angles. MM-crosslam is supplied in various manufacturer-specific surface qualities.
MM-crosslam elements are very dimensionally stable on the one hand and can also transfer loads both lengthwise and transverse to the main load-bearing direction.
MM-crosslam is manufactured from spruce, fir, pine. Other coniferous species are permissible but not typical. Adhesives in accordance with 2.5 are used for gluing. MM-crosslam is manufactured with a maximum wood moisture of 15 %. MM-crosslam is manufactured in dimensions as per 2.4.
For the placing of the product on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) the Regulation (EU) No. 305/2011 PCR applies. The product needs a Declaration of Performance taking into consideration *ETA-09/0036* and the CE-marking. For the application and use, the respective national provisions apply.

2.2 Application

Application of the products is subject to the respective national specifications.
Cross-laminated timber is used in service classes 1 and 2 in accordance with *EN 1995-1-1* in members with primarily static dead loads.
Member resistance at normal temperature and resistance to fire are dependent on the properties of the layers, cross-sectional layup, static system and load position.
Member resistance and resistance to fire must be established for the respective building in accordance with the applicable design rules.
Use of wood preservatives in accordance with *DIN 68800-3* is not typical and only permissible if other preservative means as per *DIN 68800-2* are not sufficient on their own.
Where wood preservative is used in exceptional cases, it must be regulated in the form of a national technical approval or an approval in accordance with the Biocides Directive.

2.3 Technical Data

The product's performance values are to be declared in the Declaration of Performance based on *ETA-09/0036*.
The performance data of the product are in accordance with the Declaration of Performance with respect to its essential characteristics according to *ETA-09/0036*.
MM-crosslam is produced in different strength classes. For the strength class C24/T14 the following applies:

Technical data

Name	Value	Unit
Wood types by trade names acc. to EN 1912	Coniferous wood in accordance with ETA-09/0036	-
Wood moisture acc. to ETA-09/0036	< 15	%
Use of wood preservatives (the test description as per DIN 68800-3 must be indicated)*	Iv, P and W	-
Compressive strength parallel acc. to ETA-09/0036	21	N/mm^2
Compressive strength rectangular acc. to ETA-09/0036	21	N/mm^2
Tensile strength parallel acc. to ETA-09/0036	14.5	N/mm^2
Tensile strength rectangular acc. to ETA-09/0036	0.12	N/mm^2
Modulus of elasticity acc. to ETA-09/0036	12000	N/mm^2
Shear strength acc. to ETA-09/0036	1.1	N/mm^2
Shear modulus acc. to ETA-09/0036	690	N/mm^2
Dimensional deviation	depending on geometrical dimensions	mm
Length max. acc. to ETA-09/0036	< 18.0	m
Width max. acc. to ETA-09/0036	< 4.0	m
Height (min. - max.) acc. to ETA-09/0036	0.036 - 0.36	m
Gross density acc. to EN 338**	420	kg/m^3
Surface quality	n.r.	-
Risk class acc. to DIN 68800-3	4	-
Thermal conductivity acc. to EN 12664	0.12	W/(mK)
Specific heat capacity acc. to EN 12664	1.6	kJ/kgK
Water vapor diffusion equivalent air layer thickness acc. to ISO 12572	n.r.	m
Water vapour diffusion resistance factor acc. to ISO 12572	20 - 50	-
Formaldehyde emissions acc. to EN 717-1	< E1	µg/m^3

* Use of preventive chemical wood preservatives in accordance with *DIN 68800-1* is unusual and permitted only if other preservative measures are not sufficient on their own.
** The declared density values may deviate from these average values due to different densities of the wood species used.

Performance data of the product MM-crosslam in accordance with the declaration of performance with respect to its essential characteristics according to *ETA-09/0036*, (not part of CE-marking).

2.4 Delivery status

Length up to 16.50 m
Width up to 3.5 m
Thickness up to 0.36 m

The tolerances acc. to *ETA-09/0036* are met.

MM-crosslam is available in the following surface qualities:

- Non-visible (NVI)
- Industrial-visible (IVI)
- Residential-visible (RVI)

2.5 Base materials/Ancillary materials

MM-crosslam is mainly made from spruce wood (PEFC certified), which has a wood moisture content of m.c. = 12 % (+/-2 %) (pine, fir, and other types of wood on request).

Either polyurethane (PUR) adhesives according to *EN 15425* or melamine-urea-formaldehyde adhesives (MUF) according to *EN 301* are used for bonding.
The average proportions of ingredients per m³ MM-crosslam for the environmental product declaration are:

- softwood, mainly spruce approx. 88 to 90 %
- water approx. 9 to 10 %
- adhesives ca. 0.5 to 1.2 %

The product has an average density of 470 kg/m³.

This product/article/at least one partial article contains substances listed in the *candidate list* (17.01.2023) exceeding 0.1 percentage by mass: no.

This product/article/at least one partial article contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: no.

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): no.

2.6 Manufacture

To produce MM-crosslam, softwood boards are first dried to less than 15 % wood moisture, pre-planed and sorted visually or mechanically according to strength. Identified board sections with areas that reduce strength are cut out depending on the desired strength class and the resulting board sections are joined to endlessly long lamellas using finger-jointed connections. In the following pre-planing process, the lamellas are planed on four sides to thicknesses between 19 mm and 45 mm. In some cases, the lamellas are glued together using narrow side gluing to form a single-layer panel.
Wood-based panels in accordance with *EN 13986* can also be used during production for surface qualities. After pressing and hardening, the raw element is planed, chamfered, tied and packaged.
To ensure product quality during transport to the construction site, storage or assembly, the application of a weatherproofing or wood preservative may be necessary.

2.7 Environment and health during manufacturing

During production, there are no negative impacts on water and soil. The resulting process wastewater is fed into the local sewage system and cleaned according to legal regulations. The resulting exhaust air is cleaned according to the legal regulations. Noise emissions from industrial plants are reduced by structural measures and comply with the legal requirements.

2.8 Product processing/Installation

MM-crosslam can be processed with commercially available tools. The instructions for occupational safety/assembly are to be observed.

2.9 Packaging

Polyethylene foils and small amounts of other plastics are used.

2.10 Condition of use

Composition for the period of use complies with the base material composition in accordance with section 2.5. Base materials / Ancillary materials.
Approx. 208 kg of carbon are bound in the product during use. This complies with approx. 763 kg of CO_2 for full oxidation.

2.11 Environment and health during use

Environmental protection: According to current knowledge, there are no risks for water, air and soil when the products are used as designated.

Health protection: Under normal conditions of use, MM-crosslam is not expected to cause any damage or impairments to health.
With regard to formaldehyde, MM-crosslam is low-emission thanks to its adhesive content, structure and form of use (formaldehyde emission class E1).

MM-crosslam bonded with PU-based adhesives has formaldehyde emission values in the range of the untreated raw material wood (sawn timber, by 0.004 ml/m³).

Measured against the limit value of 0.1 ml/m³ (0.124 mg/m³) of the Reach Regulation 1907/2006/EG, the measured values in accordance with *EN 717-1* can be classified as low.

MM-crosslam glued with MUF adhesives emits formaldehyde subsequently. Measured at the limit value of 0.1 ml/m³ of the Chemical Restriction Regulation, the values can be classified as low after testing *EN 717-1*.

2.12 Reference service life

Cross-laminated timber has been used in structural timber construction for more than 25 years and is very similar to glulam with more than 100 years of experience of use.
When used as designated, no end of durability must be expected due to its natural durability (protection against moisture).
When used as designated, lifetime of MM-crosslam is equal to the duration of use of the building.

2.13 Extraordinary effects

Fire

MM-crosslam is classified according to *ETA-09/0036* as follows:

Fire protection

Name	Value
Building material class	D
Burning droplets	D0
Smoke gas development	S2

Water

No ingredients are washed out which could be hazardous to water.

Mechanical destruction

The fracture pattern of MM-crosslam shows an appearance typical of solid-wood.

2.14 Re-use phase

MM-crosslam panels can be used again in principle on conversions or disassembly. Use as an energy source in controlled furnace facilities for process heat or potentially for heat and electric power generation plant is to be regarded as a worthwhile solution due to the high calorific value of the wood.

2.15 Disposal

MM-crosslam panels from dismantling operations are first and foremost to be recycled as materials. Should this not be possible, they must be used as an energy source.

Waste code numbers according to the European Waste Catalogue (EAK): 170201
Landfill dumping is not permissible.

2.16 Further information

More detailed information can be found at www.mm-holz.com.

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to a declared unit of 1 m³ of cross-laminated timber produced by Mayr-Melnhof Holz Holding AG. The declared unit refers to an average density of 470 kg/m³ and a wood moisture at delivery of 11.5 %.

Declared unit

Name	Value	Unit
Declared unit	1	m^3
Gross density	470	kg/m^3
Wood moisture at delivery	11.5	%

The present study includes a declaration of average products from a manufacturer's factory. The production conditions are comparable for all products included in the average. Differences in energy consumption for different formats cannot be quantified and can be considered negligible due to their small share of the overall result.

A possible variability is to be expected due to the use of different types of wood. The upstream supply chain for spruce wood is assumed to be representative. This applies to the majority of the wood used. The robustness of the declared LCA values can therefore be categorised as good.

3.2 System boundary

The life cycle assessment of average cross-laminated timber produced by Mayr-Melnhof Holz Holding AG refers to a cradle-to-gate analysis of the environmental impacts with modules C1–C4 and module D (A1–A3 + C + D). The following life cycle phases are part of the analysis:

Module A1–A3 | Production stage
The production stage includes the upstream burdens of raw material supply, their transports, and the manufacturing plant of Mayr-Melnhof Holz in Gaishorn am See (Austria). Main raw material inputs therefore refer to sawn timber and the production of the adhesive system. Within the plant boundaries the sorting, drying, fingerjointing, pressing and framing as well as the packaging of the product are considered. The production site is supplied with thermal energy from a biomass power plant. Furthermore, electricity is purchased as 100 % green electricity from the external grid. Direct emissions from drying are based on worst-case assumptions and are included in the study. Primary data from adhesive production was used as far as possible. The packaging of the products is considered in module A1–A3 as well.

Module C1 | Deconstruction and demolition
After the removal of building components overlying the product, the joints can simply be loosened by screwing or sawing and lifted by cranes to the place of removal. Required energy demand can be neglected. The actual energy demand depends on the installation of the products and can therefore vary greatly in the building context.

Module C2 | Transport to disposal
Module C2 includes the transport to waste treatment. In this case, transport by truck over a transport distance of 50 km is assumed.

Module C3 | Waste processing
In Module C3, the chipping after the removal of the products is considered. The wooden products and with them the material inherent properties leave the product system as secondary combustibles in module C3.

Module C4 | Disposal
The applied scenario declares the energetic recovery of the wooden products, therefore no environmental impacts are to be expected from waste processing of the products in C4.

Module D | Benefits and loads beyond the system boundary
Applying an European average scenario, module D describes the energetic recovery of the product at the end of life including the corresponding energy substitution potentials.

3.3 Estimates and assumptions

All assumptions are verified through detailed documentation and correspond to the best possible representation of reality based on the available data. Background data for wood logs refer to generic data for spruce logs in bark derived from *MLC*-database. Spruce represents the majority of wood processed at Mayr-Melnhof Holz Holding AG. The used dataset represents an approximation for all other species.

Regional applicability of the used background data refers to average data under European or German conditions taken from the *MLC*-database. German data were used for the Austrian market whenever European or regionalised average data were not available.

Emissions from wood drying were included in the calculations according to *Rüter & Diederichs 2012*.

3.4 Cut-off criteria

The LCA model covers all available input and output flows, which can be represented based on robust data and from which a significant contribution can be expected. Data gaps are filled with conservative assumptions of average data or generic data if available and are documented accordingly. Only data with a contribution of less than 1 % were cut off. Thus, no data were neglected, of which a substantial impact is to be expected. All relevant data were collected comprehensively. Cutoff material and energy flows were chosen carefully based on their expected quantitative contribution as well as potential environmental impacts. Thus, it can be assumed that the sum of all neglected input flows does not account for more than 5 % of the total material, water and energy flows.
Environmental impacts of machines, plant and infrastructure were not included.

3.5 Background data

This study uses generic background data for the evaluation of upstream environmental impacts from *MLC* 2023.2 database in the *LCA FE*-software version 10, as well as recognised literature such as *Rüter & Diederichs 2012*.

The analysis of the major amount of adhesives used for cross-laminated timber production is based on primary data from Mayr-Melnhof Holz's suppliers.

3.6 Data quality

Data collection is based on product-specific questionnaires. It follows an iterative process of clarifying questions via e-mail, telephone calls or in personal/web meetings. Intensive discussions between Mayr-Melnhof Holz Holding AG and Daxner & Merl results in an accurate mapping of product-related material and energy flows.
This leads to a high quality of foreground data collected. Data collection relies on a consistent process according to *ISO 14044*.

The representation of the main raw materials used for the production of cross-laminated timber is based on supplier specific primary data (adhesive systems) leading to a high data quality.

The technological, geographical and time-related representativeness of the database was kept in mind when selecting background data. Whenever specific data were missing, either generic datasets or representative average data were used instead. The implemented *MLC*-background datasets refer to the latest versions available and are carefully chosen.

The assessment of the robustness of the average can be found in Section 3.1

3.7 Period under review

Foreground data were collected in the 2021 production year and the data are based on the volumes produced on an annual basis.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Austria

3.9 Allocation

Cross-laminated timber as well as glued laminated timber are produced at the Mayr-Melnhof Holz production site. Where possible, the allocation of product-specific material and energy flows was based on physical relationships. Where necessary, the allocation is based on the production volumes of the individual product lines manufactured in Gaishorn.

Wooden residues are collected on site and utilised for energy recovery. As no co-products are sold externally for material use, no co-product allocation was applied.

Carbon content and primary energy content of the products were assessed based on their material inherent properties according to underlying physical relationships.

3.10 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 *MLC* 2023.2 background database in the *LCA FE*-software version 10 was used to calculate the LCA.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

During tree growth, the wood assimilates carbon dioxide and stores biogenic carbon. The carbon stored in the product is declared in the following table. Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in product	208	kg C
Biogenic carbon content in accompanying packaging	-	kg C

Installation into the building (A5)

The end of life of the product packaging is not declared in module A5.

Name	Value	Unit
Packaging (polyethylene foil)	0.92	kg
Packaging (polypropylene)	0.02	kg
Packaging (metal)	0.15	kg
Packaging (polyethylene terephthalate)	0.08	kg

The end-of-life scenario used in this LCA study is based on the following assumptions:

End of life (C1–C4)

Name	Value	Unit
Energy recovery	470	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Processing rate	100	%
Efficiency of power plant	68	%

The product reaches the end-of-waste status after removal from the building, transport to processing and chipping of the product. For the end of life of the cross-laminated timber product, energy recovery as secondary fuel in a biomass power plant is assumed. As the main sales market for the solid wood products is concentrated in the European region, plant-specific characteristic values correspond to a European average scenario (EU). 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.

5. LCA: Results

The following table contains the LCA results for a declared unit of 1 m³ of cross-laminated timber produced by Mayr-Melnhof Holz Holding AG (470 kg/m³).

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

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	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ cross-laminated timber (470 kg/m³)

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential total (GWP-total)	kg CO_2 eq	-6.42E+02	0	1.81E+00	7.66E+02	0	-3.86E+02
Global Warming Potential fossil fuels (GWP-fossil)	kg CO_2 eq	1.17E+02	0	1.72E+00	3.03E+00	0	-3.69E+02
Global Warming Potential biogenic (GWP-biogenic)	kg CO_2 eq	-7.6E+02	0	7E-02	7.63E+02	0	-1.73E+01
Global Warming Potential luluc (GWP-luluc)	kg CO_2 eq	3.99E-01	0	1.59E-02	3.3E-04	0	-2.46E-02
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	2.32E-08	0	2.23E-13	5.6E-11	0	-3.33E-09
Acidification potential of land and water (AP)	mol H^+ eq	7.54E-01	0	6.07E-03	6.48E-03	0	3.84E-01
Eutrophication potential aquatic freshwater (EP-freshwater)	kg P eq	2.04E-03	0	6.26E-06	1.13E-05	0	-6.82E-04
Eutrophication potential aquatic marine (EP-marine)	kg N eq	3.27E-01	0	2.79E-03	1.55E-03	0	7.58E-02
Eutrophication potential terrestrial (EP-terrestrial)	mol N eq	3.36E+00	0	3.13E-02	1.62E-02	0	8.93E-01
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	9.99E-01	0	5.49E-03	4.14E-03	0	3.16E-01
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	5.38E-05	0	1.13E-07	4.69E-07	0	-2.97E-05
Abiotic depletion potential for fossil resources (ADPF)	MJ	1.85E+03	0	2.33E+01	6.39E+01	0	-6.92E+03
Water use (WDP)	m^3 world eq deprived	1.81E+01	0	2.07E-02	6.76E-01	0	-1.51E+01

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ cross-laminated timber (470 kg/m³)

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier (PERE)	MJ	3.34E+03	0	1.7E+00	7.74E+03	0	-2.27E+03
Renewable primary energy resources as material utilization (PERM)	MJ	7.7E+03	0	0	-7.7E+03	0	0
Total use of renewable primary energy resources (PERT)	MJ	1.1E+04	0	1.7E+00	3.81E+01	0	-2.27E+03
Non renewable primary energy as energy carrier (PENRE)	MJ	1.71E+03	0	2.34E+01	1.64E+02	0	-6.93E+03
Non renewable primary energy as material utilization (PENRM)	MJ	1.42E+02	0	0	-1E+02	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	1.85E+03	0	2.34E+01	6.39E+01	0	-6.93E+03
Use of secondary material (SM)	kg	0	0	0	0	0	0
Use of renewable secondary fuels (RSF)	MJ	0	0	0	0	0	7.7E+03
Use of non renewable secondary fuels (NRSF)	MJ	0	0	0	0	0	1E+02
Use of net fresh water (FW)	m^3	5.69E-01	0	1.86E-03	3.08E-02	0	-1.26E+00

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ cross-laminated timber (470 kg/m³)

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	3.14E-05	0	7.25E-11	6.01E-07	0	-2.2E-07
Non hazardous waste disposed (NHWD)	kg	3.29E+00	0	3.57E-03	4.68E-02	0	2.28E-01
Radioactive waste disposed (RWD)	kg	5.56E-02	0	4.38E-05	1.01E-02	0	-6.03E-01
Components for re-use (CRU)	kg	0	0	0	0	0	0
Materials for recycling (MFR)	kg	0	0	0	0	0	0
Materials for energy recovery (MER)	kg	0	0	0	4.7E+02	0	0
Exported electrical energy (EEE)	MJ	0	0	0	0	0	0
Exported thermal energy (EET)	MJ	0	0	0	0	0	0

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ cross-laminated timber (470 kg/m³)

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Incidence of disease due to PM emissions (PM)	Disease	ND	ND	ND	ND	ND	ND

	incidence						
Human exposure efficiency relative to U235 (IR)	kBq U235 eq	ND	ND	ND	ND	ND	ND
Comparative toxic unit for ecosystems (ETP-fw)	CTUe	ND	ND	ND	ND	ND	ND
Comparative toxic unit for humans (carcinogenic) (HTP-c)	CTUh	ND	ND	ND	ND	ND	ND
Comparative toxic unit for humans (noncarcinogenic) (HTP-nc)	CTUh	ND	ND	ND	ND	ND	ND
Soil quality index (SQP)	SQP	ND	ND	ND	ND	ND	ND

The additional and optional impact categories according to *EN 15804*+A2 are not declared, as the uncertainty of these indicators is to be classified as high.

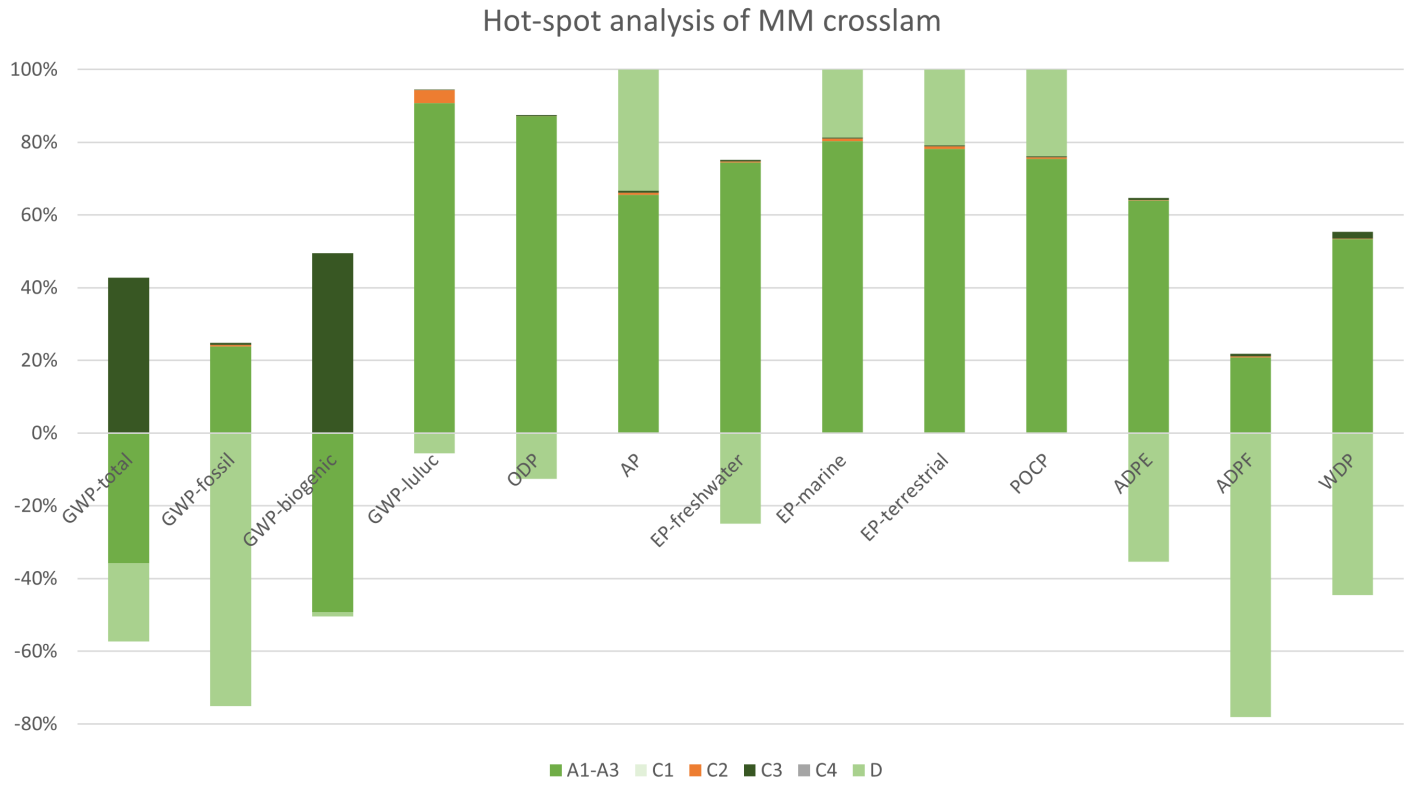
Disclaimer 1 – for the indicators 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption'.
The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

6. LCA: Interpretation

The following interpretation contains a summary of the LCA results referenced to a declared unit of 1 m³ of cross-lamianted timber.

The global warming potential (GWP) of MM-crosslam shows negative values in the production phase (**modules A1–A3**). These negative impacts results from the use of wood as raw material. Wood sequesters biogenic carbon during tree growth. The sequestered carbon does not contribute to global warming as long as it is stored in the biomass. After its use in the building, the product is assumed to be incinerated in a biomass power plant. As a result, the incorporated carbon is emitted again to the atmosphere representing biogenic carbon dioxide emissions (**module C3**).

The negative values in the end-of-life (**module D**) result from the energetic treatment of the product. As the energy produced at the biomass power plant can substitute (mainly fossil) fuels, an environmental net benefit is generated.



Potential global warming (**GWP**) from the production of MM crosslam (module A1–A3) mainly results from the upstream supply chain of the wood processed in Gaishorn. In addition, the environmental backpack of the adhesives used for production and of the transport of raw materials represent important drivers in the environmental profile of the products.

Due to the use of green electricity, electricity supply represents a minor factor in the environmental profile of the product, with the exception of potential ozone depletion (ODP) and potential depletion of abiotic, elementary resources (ADPE).

The declared results are representative for 100 % of MM-crosslam. They refer to an annual average of the total production volume of Mayr-Melnhof Holz in Gaishorn including all available
dimensions (width, height, length) and strength classes. The average considers the annual input quantity of wood and adhesives for all variants of MM-crosslam. All products undergo the same manufacturing process. Due to this fact and the homogeneous structure of the products, the declared results are expected to be representative for all products. A product-specific allocation of annual input and output flows is not possible.

7. Requisite evidence

7.1 Formaldehyde
Testing entity
MPA Eberswalde Materialprüfanstalt Brandenburg GmbH
Place of testing
Alfred-Möller-Straße 1, D-16225 Eberswalde
Test report
Test report no. 31/23/5121/01 dated 11.07.2023
Test Method
Test chamber method acc. to *EN 717-1*;
Chemical formaldehyde analysis: Acetylacetone method
Test result
Formaldehyde emissions 0.026 ppm HCHO/m³ air (acc. to 668h) i.e. far below the limit value of formaldehyde class E1 at < 0.1 ppm HCHO/m³ air.

The results meet the requirements of emission class E1 according to *EN 16351* of 0.124 mg/m³.

7.2 MDI
When gluing MM-crosslam with PUR-based adhesive the curing reaction occurs in the cold state and the contained MDI will react completely. Thus, a MDI emission from the finished MM-crosslam panel is not possible.
For cold-glued, load-bearing solid wood products that use one-component polyurethane adhesives, it is not necessary to state the obligation to provide proof.
When using 2-component melamine-urea-formaldehyde adhesives for the production of MM-crosslam, MDI emissions from cured MM-crosslam are not possible because this adhesive system does not contain MDI.

7.3 Toxicity of fire gases
The toxicity of the fire gases produced by burning MM-crosslam corresponds to those produced by burning untreated wood.

7.4 VOC
Test entity
MPA Eberswalde Materialprüfanstalt Brandenburg GmbH
Place of testing
Alfred-Möller-Straße 1, D-16225 Eberswalde
Test report
Test report no. 31/22/4905/02 vom 27.01.2023
Prüfmethodik und Ergebnis
Test chamber method acc. to *EN 16516*, VOC emissions were analysed in accordance with *ISO 16000.*

AgBB-result overview (28 days[µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	290	µg/m³
Sum SVOC (C16 - C22)	< 5	µg/m³
R (dimensionless)	0.38	-
VOC without NIK	12	µg/m³
Carcinogenic Substances	< 1	µg/m³

AgBB-result overview (3 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	370	µg/m³
Sum SVOC (C16 - C22)	< 5	µg/m³
R (dimensionless)	0.53	-
VOC without NIK	32	µg/m³
Carcinogenic Substances	< 1	µg/m³

8. References

Standards

DIN 68800-1
DIN 68800-1:2019-06, Wood protection – Part 1: General information.

DIN 68800-2
DIN 68800-2:2012-02, Wood protection – Part 2: Preventive structural measures in civil engineering.

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

EN 301
ÖNORM EN 301:2023-06-01, Adhesives, phenolic and aminoplastic, for load-bearing timber structures - Classification and performance requirements.

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

EN 717-1
ÖNORM EN 717-1:2005-01, Wood-based panels – Determination of formaldehyde release – Part 1: Formaldehyde emission by the chamber method.

EN 1912
ÖNORM EN 1912:2013-10-15, Structural Timber - Strength classes - Assignment of visual grades and species (consolidated version).

EN 1995-1-1
ÖNORM EN 1995-1-1:2019-06-01, Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings (consolidated version).

EN 12664
DIN EN 12664:2001, Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products with medium and low thermal resistance.

EN 13986
ÖNORM EN 13986:2015-06-01, Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking.

EN 14081-1
ÖNORM EN 14081-1:2005, Timber structures - Strength graded structural timber with rectangular cross section - Part 1: General requirements.

EN 15804
DIN EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works Environmental product declarations Core rules for the product category of construction products.

EN 15425
ÖNORM EN 15425:2023-06-15, Adhesives - One component polyurethane (PUR) for load-bearing timber structures - Classification and performance requirements.

EN 16351
ÖNORM EN 16351:2021-06, Timber structures -Cross laminated timber - Requirements.

EN 16516
DIN EN 16516:2017+A1:2020, Construction products: Assessment of release of dangerous substances - Determination of emissions into indoor air.

ISO 12572
DIN EN ISO 12572:2016, Hygrothermal performance of building materials and products - Determination of water vapour transmission properties - Cup method.

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

ISO 14044
DIN EN ISO 14044:2006-10, Environmental management – Life cycle assessment – Requirements and guidelines.

ISO 16000
DIN EN ISO 16000-3:2011, Indoor air - Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air - Active sampling method.

DIN EN ISO 16000-6:2011, Indoor air - Part 6: Determination of volatile
organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS or MS-FID.

Further literature

AgBB-scheme
Committee for Health-related Evaluation of Building Products (AgBB): Requirements for the Indoor Air Quality in Buildings: Health-related Evaluation Procedure for Emissions of Volatile Organic Compounds (VVOC, VOC and SVOC) from Building Products.

Biocidal Products Regulation
Regulation (EU) No 528/2012 of the EuropeanParliament and of the Council of 22 May 2012 concerning the making available on the market anduse of biocidal products.

Candidate list
List of substances of very high concern considered for approval (status 17.01.2023) according to Article 59 para. 10 of the REACH Regulation. European Chemicals Agency.

CLT information brochure
Information brochure – Cross laminated timber der Studiengemeinschaft Holzleimbau e.V., 2023..

ETA-09/0036
ETE-09/0036 MM-crosslam, Mayr-Melnhof Holz Holding AG, 21.04.2023

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General instructions for the EPD program of Institut Bauen und Umwelt e.V. (IBU). Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021. www.ibu-epd.com

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LCA FE 10, LCA for Experts Software System and Database for Life Cycle Engineering. Version 10.7.1.28. Sphera, 19922023.

MLC
MLC 2023.2, Database for Life Cycle Engineering implemented in LCA for Experts software system. DB v10.7 2023.2. Sphera, 1992-2023. Verfügbar in: https://sphera.com/productsustainabilitygabidatasearch/.

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Meyer, B., Boehme, C.: 1994, Formaldehydabgabe von natürlich gewachsenem Holz, Holzzentralblatt 122 (Formaldehyd release of naturally grown wood), S. 1969-1972.

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Product category rules for building-related products and services. Part A: Calculation rules for the life cycle assessment and requirements for the project report in accordance with EN 15804+A2:2019. Version 1.3. Berlin: Institut Bauen und Umwelt e.V. (eds.), 2022.

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Product category rules for building-related products and services. Part B: EPD requirements for solid wood products. Version 5, Berlin: Institut Bauen und Umwelt e.V., 18 July 2023.

Test report no. 31/23/5121/01
Test Report no. 31/23/5121/01: Determination of formaldehyde release of wood-based material according to DIN EN 717-1:2005, 11.07.2023, MPA Eberswalde, Materialprüfanstalt Brandenburg GmbH Eberswalde.

Test report no. 31/22/4905/02
Test Report no. 31/22/4905/02: Test chamber method (EN 16516:2017+A1:2020): Construction products: Assessment of release of dangerous substances - Determination of emissions into indoor air, 27.012023, MPA Eberswalde, Materialprüfanstalt Brandenburg GmbH Eberswalde.

Rüter & Diederichs 2012
Rüter, S.; Diederichs, S.: Basic life cycle assessment data for construction products made of wood. Working report from the Institut für Holztechnologie und Holzbiologie No. 2012/1. Hamburg: Johann Heinrich von Thünen Institut.

1907/2006/EG
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).

2005/610/EG
2005/610/EG, COMMISSION DECISION of 9 August 2005 establishing the classes of reaction-to-fire performance for certain construction products.

2014/955/EU
2014/955/EU,COMMISSION DECISION of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council.

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