Environmental
Product
Declaration
According to ISO14025 and EN15804+A2

This declaration is for:
DERIX Glued laminated timber (Glulam)

Provided by:
Derix-Group

program operator
Stichting MRPI®
publisher
Stichting MRPI®
www.mrpi.nl

MRPI® registration
1.1.00666.2024
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COMPANY INFORMATION

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MRPI® REGISTRATION

1.1.00666.2024

DATE OF ISSUE

25-10-2024

EXPIRY DATE

25-10-2029

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by Gert-Jan Vroege, Eco Intelligence. The LCA study has been done by Mark Wildschut, Wildcap The certificate is based on an LCA-dossier according to EN15804+A2. It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPD's of construction products may not be comparable if they do not comply with EN15804+A2. Declaration of SVHC that are listed on the 'Candidate list of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

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PRODUCT

DERIX Glued laminated timber (Glulam)

DECLARED UNIT/FUNCTIONAL UNIT

1m3

DESCRIPTION OF PRODUCT

DERIX Glued laminated timber (glulam) consists of kiln-dried wooden boards that are joined together by finger-jointing to form a continuous lamella and glued firmly together in layers.

VISUAL PRODUCT

MORE INFORMATION

https://derix.de/en/products-engineered-timber-construction/glued-laminated-timber-glulam/

DEMONSTRATION OF VERIFICATION
CEN standard EN15804 serves as the core PCR(a)
Independent verification of the declaration an data according to ISO14025 and EN15804+A2 internal: external: x
Third party verifier: Gert-Jan Vroege, Eco Intelligence
[a] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

Environmental certificates

International certifications can be found on https://derix.de/. PEFC chain of custody was checked at the PEFC certificate holders registry on the date of drafting this report.

Goal

The purpose of this EPD is to gain insight, and build knowledge on the environmental performance of the client's product's lifecycles. The data emerging from this report is made for business-to-business communication directly and for inclusion on Eco-platform via MRPI but can also be used for business-to-consumer communication purposes. The target group is, in addition to the client, their customers and users of the platform.

Product description

The DERIX-Group is a German company group that specializes in the production of CLT (X-LAM) and glulam used for construction. Glulam, the product in this study consists of wood which is finger jointed and glued. The product processes of glulam and X-LAM are almost identical, aside from the orientation of the slats and the used adhesive/hardener. The wood is all sourced sustainable, harvested from certified (PEFC) European forests and is purchased pre-dried and is untreated. Glulam components are usually applied as structural columns, beams and girders and X-LAM components are usually structural floors / ceilings and walls. The product is pre-fab produced in the manufacturing facility, the wood is planed, dimensioned and sorted visually and/or mechanically by strength. Then, pressed and glued into larger boards, CNC machined for electrical cut-outs etc. and packaged in a thin PE film before being transported to the customer.

Reference service life

The expected service life of construction products is >100 years [SBR, 2011], which refers to the expected life of the construction itself. In practice the product should exceed the service life.

Scaling

Scalability per unit, other than the functional unit: The product is scalable within the boundaries described in the LCI, per thickness for flooring, and per width and thickness for columns and beams.

Glulam Dimensions (based on min-max from both sites)	min.	max.
length	4,00 m	60,00 m
width	3 cm	32 cm
thickness	6 cm	260 cm

Glulam technical information:
Strength classes: GL 24c for express programme standard
GL 28c / GL 30c for structural components (DIN EN 14080:2013-09)
Wood moisture: 10 ± 2 %
Adhesive: Melamine resin gluing system GripPro-Plus, approved according to DIN EN 301:2018.

Declared unit

The final products are presented per m^3 and based on finished products. Materials <1% are not included in this calculation. Conversion to m^2 for wall and flooring (100mm) and/or m^{-1} for beams (100x1000mm) can be achieved by multiplying the end results by 0,10.

Functional unit	Value	Unit
Glulam	1	m^3
Density	478	kg/m^3

Component (> 1%)	**(%)**
MUF glue	<1%
MUF harderer	<1%
PU Glue	<1%
Wood (Spruce PEFC)	>98%

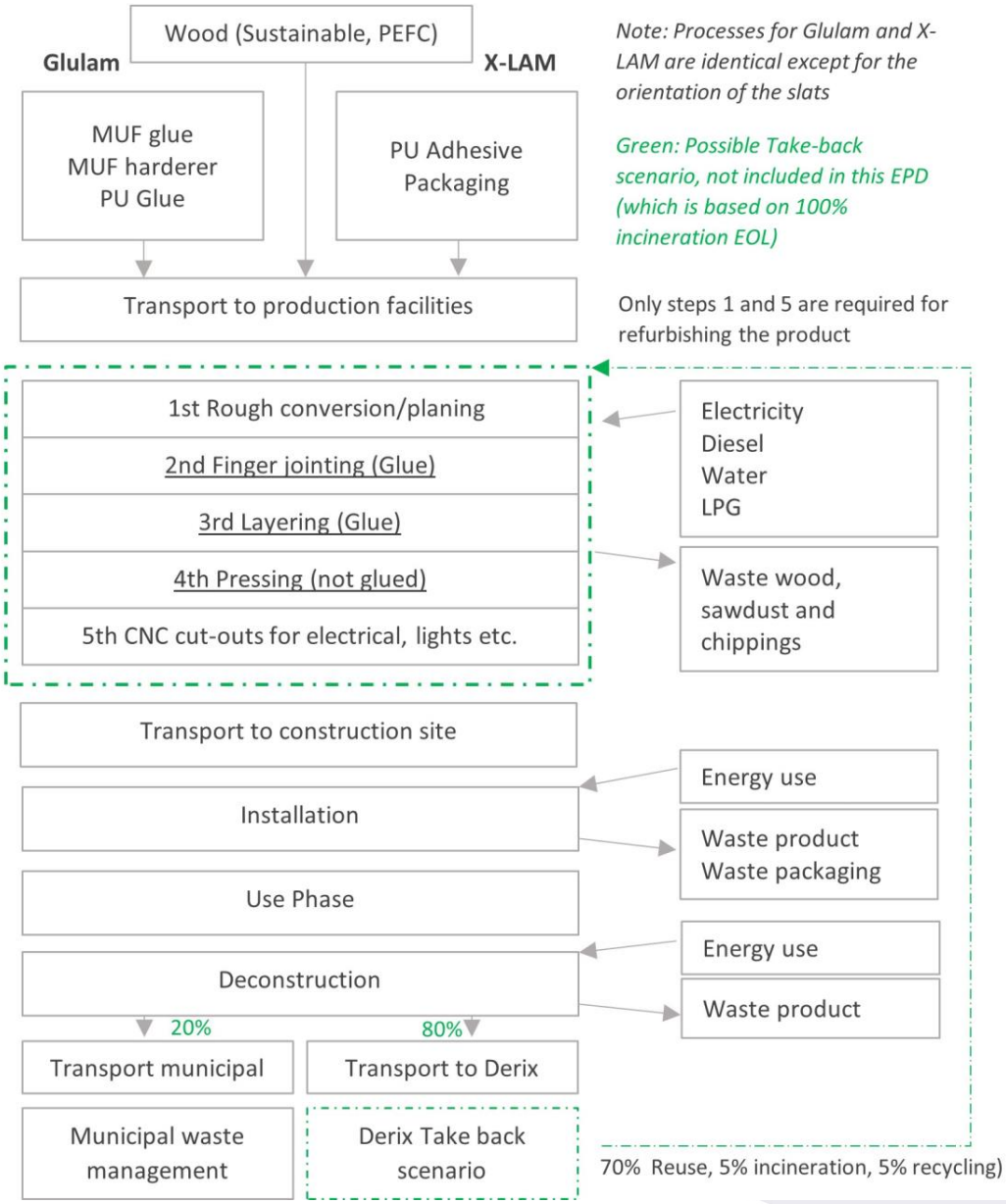
SCOPE AND TYPE

Glulam is produced at both the production sites Niederkrüchten and Westerkappeln, for these production processes the weighted averages have been used from both facilities. End of life scenarios are based on germany with 100% incineration at end of life, in the original EPD also other End of Life scenarios are shown, including a take-back system implemented by DERIX. Transport to the building site is set to 1km so the customer can calculate their impact accordingly.

Software and databases: SimaPro version 9.5.0.2 and the Ecoinvent database version 3.6 and NMD 3.8.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USER STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse- Recovery – Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	NA	NA	NA	NA	X	X	X	X	X
X= Modules Assessed ND= Not Declared																

Figure: Flowchart Derix Glulam and X-LAM



REPRESENTATIVENESS

Glulam is produced at both Niederkrüchten and Westerkappeln, for these production processes the weighted averages have been used from both facilities.

Data quality

The quality of the data is considered good. With economic flows qualified, quantified and a process mass balance closure of >99%. The company, process and product data is provided by the DERIX-Group. The energy and mass balance at company level could not be verified due to the complexity, but balances are shared in detail: annual energy invoicing, green certificates, materials flows, etc. Significant waste streams are included. Material input/outputs streams are based on purchasing, waste and sales figures. A check on significance of other waste streams based on the mass balance has been executed and deemed insignificant, these figures are supported by documentation from supply chain partners. Production processes can change over time. The information used in this LCA of the production process of the element is based on measurements and observations from 2022 (energy, waste percentages, quantities net per element, production volume). All data have been checked for topicality with the client. The most important raw material, wood, for the products described in this LCA comes from sustainably managed (PEFC certified) forests in middle and northern Europe. The calculation is made based upon the current suppliers. Other products (glue) are not tied to a specific location of raw materials. All the data are checked on uniformity and consistency. All sources and data used is documented. Ownership: This is a protected process, however, it can be reproduced by external entities with permission.

ENVIRONMENT IMPACT per functional unit or declared unit (core indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	-9,81 E+02	4,05 E+01	2,37 E+02	-7,03 E+02	4,49 E-02	5,96 E+00	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	2,81 E+00	9,68 E+00	7,74 E+02	0,00 E+00	-4,05 E+02
GWP-fossil	kg CO2 eq.	1,20 E+02	4,04 E+01	-9,32 E+01	6,72 E+01	4,48 E-02	5,74 E+00	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	2,60 E+00	9,67 E+00	4,20 E+00	0,00 E+00	-4,05 E+02
GWP-biogenic	kg CO2 eq.	-1,10 E+03	2,94 E-02	3,31 E+02	-7,71 E+02	3,15 E-05	2,02 E-01	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	2,09 E-01	4,47 E-03	7,69 E+02	0,00 E+00	-2,28 E-02
GWP-luluc)	kg CO2 eq.	5,73 E-01	1,18 E-02	-2,04 E-02	5,64E-01	1,42 E-05	2,02 E-02	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	3,15 E-03	3,54 E-03	1,13 E-03	0,00 E+00	-2,75 E-01
ODP	kg CFC11 eq.	2,04 E-05	9,50 E-06	-8,97 E-06	2,10 E-05	1,08 E-08	8,13 E-07	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	1,02 E-07	2,13 E-06	5,37 E-07	0,00 E+00	-2,72 E-05
AP	mol H+ eq.	8,60 E-01	1,70 E-01	-3,92 E-02	9,91 E-01	1,66 E-04	4,35 E-02	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	7,54 E-03	5,61 E-02	1,49 E-01	0,00 E+00	-7,80 E-01
EP-freshwater	kg PO4 eq.	5,61 E-03	3,08 E-04	-3,25 E-04	5,59 E-03	3,74 E-07	5,67 E-04	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	3,94 E-04	9,76 E-05	8,55 E-05	0,00 E+00	-3,31 E-02
EP-marine	kg N eq.	2,67 E-01	5,11 E-02	8,13 E-03	3,26 E-01	4,31 E-05	1,37 E-02	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	1,17 E-03	1,98 E-02	6,94 E-02	0,00 E+00	-1,30 E-01
EP-terrestrial	mol N eq.	3,34 E+00	5,65 E-01	1,00 E-01	4,01 E+00	4,79 E-04	1,70 E-01	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	1,85 E-02	2,18 E-01	7,96 E-01	0,00 E+00	-1,90 E+00
POCP	kg NMVOC eq.	8,65 E-01	1,82 E-01	-1,29 E-02	1,03 E+00	1,67 E-04	4,28 E-02	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	3,50 E-03	6,22 E-02	2,08 E-01	0,00 E+00	-4,60 E-01
ADP-minerals & metals	kg Sb eq.	2,45 E-03	6,89 E-04	9,98 E-05	3,24 E-03	8,61 E-07	1,27 E-04	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	2,16 E-05	2,45 E-04	2,55 E-05	0,00 E+00	-1,13 E-03
ADP-fossil	MJ, net calorific value	2,26 E+03	6,29 E+02	-1,35 E+03	1,54 E+03	7,18 E-01	8,73 E+01	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	3,53 E+01	1,46 E+02	4,33 E+01	0,00 E+00	-5,62 E+03
WDP	m3 world eq. Deprived	5,86 E+01	2,04 E+00	4,09 E+00	6,48 E+01	2,37 E-03	2,14 E+00	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	1,34 E-01	5,22 E-01	1,53 E+00	0,00 E+00	-9,27 E+00

GWP-total = Global Warming Potential total
GWP-fossil = Global Warming Potential fossil fuels
GWP-biogenic = Global Warming Potential biogenic
GWP-luluc = Global Warming Potential land use and land use change
ODP = Depletion potential of the stratospheric ozone layer
AP = Acidification Potential, Accumulated Exceedence
EP-freshwater = Eutrophication Potential, fraction of nutrients reaching freshwater end compartment
EP-marine = Eutrophication Potential, fraction of nutrients reaching marine end compartment
EP-terrestrial = Eutrophication Potential, Accumulated Exceedence
POCP = Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals&metals = Abiotic Depletion Potential for non-fossil resources [2]
ADP-fossil = Abiotic Depletion for fossil resources potential [2]
WDP = Water (user) deprivation potential, deprivation-weighted water consumption [2]

Disclaimer [2]
- The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ENVIRONMENT IMPACT per functional unit or declared unit (additional indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease incidence	4,66 E-05	3,65 E-06	3,77 E-08	5,03 E-05	3,94 E-09	1,60 E-06	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	2,93 E-08	8,69 E-07	1,20 E-06	0,00 E+00	-2,86 E-06
IRP	kBq U235 eq.	1,83 E+01	2,75 E+00	-4,80 E-01	2,06 E+01	3,11 E-03	7,50 E-01	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	1,11 E-01	6,11 E-01	1,10 E-01	0,00 E+00	-1,03 E+01
ETP-fw	CTUe	4,80 E+03	5,01 E+02	-3,68 E+02	4,93 E+03	5,84 E-01	1,85 E+02	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	2,94 E+01	1,30 E+02	1,08 E+02	0,00 E+00	-2,91 E+03
HTP-c	CTUh	2,32 E-07	1,23 E-08	3,01 E-08	2,75 E-07	1,51 E-11	1,33 E-08	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	6,75 E-10	4,22 E-09	1,41 E-07	0,00 E+00	-7,19 E-08
HTP-nc	CTUh	3,67 E-06	5,69 E-07	2,74 E-08	4,26 E-06	6,40 E-10	1,73 E-07	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	2,66 E-08	1,42 E-07	4,46 E-07	0,00 E+00	-2,09 E-06
SQP	----	1,28 E+05	7,20 E+02	-2,69 E+03	1,26 E+05	7,86 E-01	3,80 E+03	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	8,50 E+00	1,27 E+02	1,40 E+01	0,00 E+00	-6,24 E+02

PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235 [1]
ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]
HTP-c = Potential Comparative Toxic Unit for humans [2]
HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]
SQP = Potential soil quality index [2]

Disclaimer [1]
- This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste.

Disclaimer [2]
- The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 / A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	3,58 E-03	1,52 E-03	-4,53 E-04	4,65 E-03	1,75 E-06	2,00 E-04	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	4,43 E-05	3,70 E-04	1,22 E-04	0,00 E+00	-3,60 E-03
NHWD	kg	4,48 E+01	5,47 E+01	2,42 E+00	1,02 E+02	5,94 E-02	3,62 E+00	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	1,48 E-01	9,25 E+00	3,13 E+00	0,00 E+00	-1,30 E+01
RWD	kg	1,47 E-02	4,29 E-03	-3,30 E-04	1,87 E-02	4,87 E-06	7,36 E-04	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	1,42 E-04	9,58 E-04	1,31 E-04	0,00 E+00	-1,29 E-02
CRU	kg	0,00 E+00	0,00 E+00	4,95 E+01	4,95 E+01	0,00 E+00	1,48 E+00	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
MFR	kg	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	1,40 E-02	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
MER	kg	0,00 E+00	0,00 E+00	1,24 E+02	1,24 E+02	0,00 E+00	1,83 E+01	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	4,78 E+02	0,00 E+00	0,00 E+00
EEE	MJ	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	3,84 E+01	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	1,21 E+03	0,00 E+00	0,00 E+00
ETE	MJ	0,00 E+00	0,00 E+00	1,30 E+03	1,30 E+03	0,00 E+00	1,17 E+02	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	2,47 E+03	0,00 E+00	0,00 E+00

HWD = Hazardous Waste Disposed
NHWD = Non Hazardous Waste Disposed
RWD = Radioactive Waste Disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported Electrical Energy
ETE = Exported Thermal Energy

RESOURCE USE per functional unit or declared unit (A1 / A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	1,30 E+04	0,00 E+00	0,00 E+00	1,30 E+04	0,00 E+00	3,90 E+02	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
PERM	MJ	9,87 E+03	0,00 E+00	0,00 E+00	9,87 E+03	0,00 E+00	2,96 E+02	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
PERT	MJ	2,29 E+04	7,91 E+00	-1,68 E+02	2,27 E+04	9,02 E-03	6,88 E+02	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	6,43 E+00	1,83 E+00	1,93 E+00	0,00 E+00	-3,80 E+02
PENRE	MJ	2,45 E+03	0,00 E+00	0,00 E+00	2,45 E+03	0,00 E+00	7,35 E+01	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
PENRM	MJ	2,39 E+01	0,00 E+00	0,00 E+00	2,39 E+01	0,00 E+00	7,16 E-01	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
PENRT	MJ	2,41 E+03	6,67 E+02	-1,49 E+03	1,58 E+03	7,62 E-01	9,16 E+01	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	3,79 E+01	1,55 E+02	4,67 E+01	0,00 E+00	-6,13 E+03
SM	kg	1,04 E-01	0,00 E+00	0,00 E+00	1,04 E-01	0,00 E+00	3,13 E-03	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
RSF	MJ	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
NRSF	MJ	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00
FW	m3	1,83 E+00	7,16 E-02	1,32 E-01	2,03 E+00	8,27 E-05	8,46 E-02	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	1,61 E-02	1,78 E-02	2,32 E-01	0,00 E+00	-1,32 E+00

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

BIOGENIC CARBON CONTENT per functional unit or declared unit (A1 / A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
BBCpr	Kg C	-3,00 E+02	0,00 E+00	9,00 E+01	-2,10 E+02	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	2,10 E+02	0,00 E+00	0,00 E+00
BCCpa	kg C	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	ND	ND	ND	ND	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00	0,00 E+00

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging

CALCULATION RULES

Methodology and calculation methods

The LCA has been carried out in accordance with EN 15804 +A2. Taking into account the standards from the ISO 14000 series: 14025, 14040 and 14044. NEN-EN 16485 is used for general rules for environmental declarations of wood products. EN-16449 is used for calculating the biogenic carbon content in the wood.

Software and databases: SimaPro version 9.5.0.2 and the Ecoinvent database version 3.6 and NMD 3.8.

- <1% of the product by weight has been excluded from this LCA.
- Suppliers are requested to provide EPD data, the PU adhesive is based on a representative EPD.
- Metal parts (saws, drills and mills) are roughly inventoried and concluded to be <1%.

The information contained in this document is provided under the responsibility of W. u. J. Derix GmbH & Co. and conducted according to the requirements of:

- Leading PCR: EN 15804+A2:2019
- Support PCR: NMD Determination method Environmental performance Construction works v1.1 March 2022 (National EPD Database of the Netherlands)
- Support PCR: EN16485:2014 Round and sawn timber – Environmental Product Declarations – Product category rules for wood and wood-based products for use in construction
- ISO 14044:2006-10, Environmental management - Life cycle assessment – Requirements and guidelines; EN ISO 14040:2006

Additional information

Biogenic carbon storage

Biogenic carbon storage from wood growth is shown in the calculation (A1) but does not impact the final result due to the release of carbon in the waste management phase (C3), Also referred to as the -1/+1 method. Thus, only resulting in temporary carbon storage during the product lifecycle. The carbon content is estimated according to EN 16449. Spruce is used in combination with a moisture content of 12% and set to 770 kg CO2eq per m³, equivalent to (12/44) = 210 kgC.

Scaling

Scalability per unit, other than the functional unit: The product is scalable within the boundaries described in the LCI, per thickness for flooring, and per width and thickness for columns and beams.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

Life Cycle per phase

As the products under study are produced pre-fab, a lump sum value for waste on the construction site of 3% is assumed in the construction phase (A5).

Note: Biogenic Carbon

Biogenic carbon mass balance is executed to correct for differences input, waste processes and beneficiary energy content processes. A manual adjustment was made to result in a mass balance of +/- zero, also referred to as the -1/+1 method. The biogenic carbon content is calculated according to EN-16449. The 1,43m3 (Glulam) per FU in A1 results in a higher temporary carbon uptake in A1 in comparison to the 770kgCO2eq mentioned in the biogenic information in this report.

Raw material supply (A1)

Production phase quantities include all materials used in the production phase in their gross weight. Product packaging for both Glulam and X-LAM is included in the functional unit, which is a mix of polyethylene (PE) film. The packaging films have been merged into 1 process due to similarities and expected insignificance to the result.

Transport (A2)

Transport movements are based on google maps distances from supplier to the production facility. Distances are from multiple suppliers, a weighted annual average has been used based on the m³ of wood supplied.

Manufacturing (A3)

The wood conversion rate of 1,43m³ input to 1 m³ final product was calculated for Glulam. The conversion factors are based on the annual purchasing numbers for 2022. The wood waste from this conversion is used A) directly for incineration at the site for energy / heating purposes, B) exported as wood waste for incineration/pellets and C) for reusing the wood chips for stables etc. Other waste streams are inventoried based on waste processor documentation and relevant streams have been included. Utility and material usage is described in A1 and the previous chapter. See figure: flowchart Derix Glulam and X-LAM for more information on the production process.

Energy consumption
Energy consumption is based on annual invoice data for the final production facility of Derix in Germany. Purchased 'green certificates' for renewable electricity are used as evidence for renewable energy use, according to 15804+A2, in combination with an on-site PV installation for which metering is provided from DERIX's internal monitoring system. Biomass from the production process is used for internal heating and LPG and diesel are used for internal transport steps.

Note on a negative value for A3 GWP(fossil): Wood is processed and sawn/profiled to be transformed into the final product. The conversion and thus wood waste as an output of the production process in A3 is used for biomass energy generation, which can be compensated for (benefit) according to the calorific value in the waste product. Using the profiles allowed by 15804+A2, lead to a negative A3 indicator for GWP(fossil) and thus has quite an impact on the final result. To correct for a scenario without processing/conversion: GWP biogenic in A1 must be adjusted to a 1 m³ input (770 kgCO2eq provided in this report) and compensated for +/- no carbon leaving the system in A3 (no +kgCO2eq GWPb in A3) as conversion is not taken into account during manufacturing. Next, the GWPf needs to be corrected to remove the benefits from incineration: Excluding the conversion in the model shows an GWP-fossil sum in A1-A5: Glulam = 132,94 kgCO2eq.

Construction phase (A4-5)
The product is transported to the construction site. The distance to construction site is set to 1, so the user can multiply the values with their own distances per project. Truck fuel type (EURO type, 86% EURO 6) is divided based on the annual report of the transporting company specified for Derix. 3% extra production and direct losses from prefab (waste) are included in A5 (lump sum value also used in the dutch environmental database). Estimated use of an electric crane at 135.2 kWh per day (per 30m3 installed product) is used for the installation.

Use phase (B1-7)
The product does not need additional maintenance, during it's life time, when installed and used correctly.

Disassembly and demolition (C1)
No values for demolition of wooden constructions are available as generic data or via an PCR. Therefore the impact of C1 is assumed to be equal to module A5.

Transport (C2)
The process used for the transport steps is set to: Transport, freight, lorry, unspecified {GLO}| market group for transport, freight, lorry, unspecified | Cut-off, U and the distances are set to: landfill (100km), incineration (150km), recycling (150km). These transport movements are used in A3, A5 and C2.

Waste treatment (C3-C4)
The following table has been used based on the Germany market, which is 100% recovery for biomass incineration (based on Waste wood, untreated {DE}| market for waste wood, untreated | Cut-off, U). The wood can be processed as 'clean wood' due to the small percentage of adhesive and it is not chemically treated.

Waste treatments per material	Keep	Landfill	Energy/AVI	Recycling	Reuse
Wood, untreated (DE)	0%	0%	100%	0%	0%

Benefits: Reuse, Recovery, recycling, potential (D)
Energy recovery
The income and expenses outside the system boundary relate to combustion in which energy use is avoided. For the estimated efficiency of the energy carrier to output, the electric yield MJ is set to 18.01% and thermal yield to 36.6%.

DECLARATION OF SVHC

We confirm that the substances used in the production of X-LAM and Glulam at the DERIX Group are not subject to declaration for SVHC in accordance with REACH regulation.

REFERENCES

References
ISO 14040
ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006

ISO 14044
ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14040:2006

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

ISO 16485
ISO 16485:2014: Round and sawn timber - Environmental Product Declarations - Product category rules for wood and wood-based products for use in construction

EN 15804+A2
EN 15804+A2: 2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

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IBU
IBU (2022) Products based on polyurethane or silane-modified polymer, group 1. EPD-FEI-20220021-IBG1-EN

DTU
DTU (2007) Performance of old glulam structures in Europe, ISBN 9788778772527

REMARKS

Disclaimer

This report can only be used as a whole, if part of the information is used, the user must refer to the entire report. The report is the property of the manufacturer and may not be used by third parties without the written consent of the manufacturer.

Comparisons based on the information from this report are only possible and valid if the starting points of the calculations and data collection are the same and it concerns the same applications, as PCRs and general program instructions of different EPDs programs may differ. Comparability always needs to be evaluated. For further guidance, see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).