B-EPD ENVIRONMENTAL PRODUCT DECLARATION

STABILAME
Glued Cross Laminated Timber

1m^3 of glued CLT (Cross Laminated Timber) as structural element (walls, roofs, floors, etc.) in a building, with a RSL of 100 years.

Issued 16.12.2020
Valid until 16.12.2025

Third party verified
Conform to EN 15804+A2,NBN/DTD B08-001 and ISO 14025

Modules declared (Cradle to Grave)					
A123	A4	A5	B	C	D
●	●	●	●	●	●

[B-EPD n° 2000102_002_EN]

STABILAME
ARCHITECTURE LOVES WOOD

OWNER OF THIS ENVIRONMENTAL PRODUCT DECLARATION
Stabilame

EPD PROGRAM OPERATOR
Federal Public Service of Health, Food Chain Safety and Environment
www.b-epd.be

The intended use of this EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings. This EPD is only valid when registered on www.b-epd.be. The FPS Public Health cannot be held responsible for the information provided by the owner of the EPD.

PRODUCT DESCRIPTION

PRODUCT NAME

Stabilame Glued Cross Laminated Timber (CLT)

PRODUCT DESCRIPTION AND INTENDED USE

Glued CLT elements are monolithic elements with maximum dimensions of 3,15 m width and 12,15 m length, in spruce. Different thicknesses are available: 80, 100, 120, 140, 160, 180 and 200 mm.
Glued CLT product is made from wooden boards, assembled with glue and hardener.
Stabilame is certificated PEFC for its wood coming from sustainably managed forests, and also received the bio-based label “biosourcé – filière wallonne” (bio-based – walloon sector) for its glued CLT process. The glued CLT is made of 98% bio-based materials (mass), with at least 90% coming from Wallonia (Belgium).

The reference glued CLT for this B-EPD is 160 mm thick, with five layers and a water vapour diffusion resistance of $\mu \leq 50$ (dry) and $\mu \leq 20$ (wet). It has a thermal conductivity (λ) equal to 0.13 W/mK, approved by CSTC in Belgium. The product airtightness gives a Q_{50} equal to 0.13 $m^3/h/m^2$. Good acoustic insulation can be reached due to the wall composition.
Glued CLT constructions can be prefabricated which allows fast assembly on site. Both 2D and 3D building prefabrication are possible. After deconstruction of the building, it is possible to cut the recovered elements into new elements. However, for this B-EPD, a conservative EoL scenario has been taken into account
This report is a specific EPD from a single company: Stabilame.
The product is used as a structural element in walls, roofs, floors, etc.

REFERENCE FLOW / DECLARED UNIT

The functional unit is:

“Ensure the functionality of the structural element (walls, roofs, floors, etc.) in a building, with 1m^3 of glued CLT (Cross Laminated Timber), installed following the manufacturer recommendations, and with a design life-span of 100 years, ensuring the product performances.”*
** results are obtained based on a product with five layers of wooden boards.”*

The reference flow is 1 m^3 of glued CLT with five layers (3 layers of 40mm and 2 layers of 20mm thickness), and a total thickness of 160 mm.

The packaging of the product is included. The weight per reference flow is 470 kg, and the density of the product is 470 kg / m^3.

INSTALLATION

Materials for fixation and installation are included. This EPD contains the impacts of all processes, fixating materials, jointing material, or treatments necessary for installing/mounting the product, according to following scenario(s): *energy consumption of the crane and drill energy consumption used to fix the CLT with galvanised steel screws.*

IMAGES OF THE PRODUCT AND ITS INSTALLATION

COMPOSITION AND CONTENT

The main components of the product are

Components	Composition / content / ingredients	Quantity
Product	*- wood* *- glue and hardener*	*- 98.7%* *- 1.3%*
Fixation materials	*- galvanized steel screws, brackets, …*	*0.125 kg/m² (five layers glued CLT)*
Jointing materials	*- Not applicable for this product*	
Treatments	*- Not applicable for this product*	
Packaging	*-Packaging film*	*0.025 kg/m² (five layers glued CLT)*

The product does not contain materials listed in the “Candidate List of Substances of Very High Concern for authorisation”.

REFERENCE SERVICE LIFE

Cross laminated timber products are already installed in existing buildings from previous decades (product intrinsic material properties lead to good long-term performances). Several construction works may be found in Europe containing the product from decades ago.

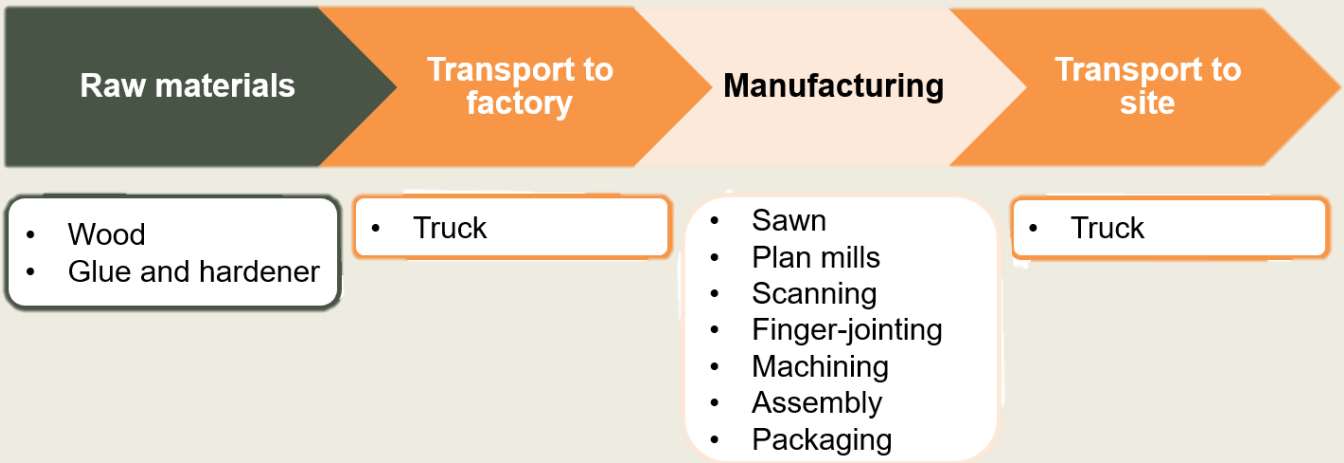
The reference service life is estimated at 100 years (installed products are still in use) if the product is installed according to the manufacturers’ and suppliers’ guidelines. The RSL is based on expert judgment.

DESCRIPTION OF GEOGRAPHICAL REPRESENTATIVITY

The reference product of this B-EPD is representative for the Belgian market.

DESCRIPTION OF THE PRODUCTION PROCESS AND TECHNOLOGY

Product stage (A1-3): The wood, glue, and hardener are transported by truck to the production plant. The manufacturing is composed of sawn, plan mills, scanning, finger-jointing, machining, and assembling processes. The glued CLT is packed and transported to the construction site.



TECHNICAL DATA / PHYSICAL CHARACTERISTICS

Technical property	Standard	Value	Unit	Comment
Thermal resistance (R)		1.23	m^2K/W	
Lambda value (λ)		0.13	W/(m.K)	
Average density		470	kg/m^3	

LCA STUDY

DATE OF LCA STUDY
The cradle-to-grave LCA study was conducted in September 2020. The information contained in this document are provided under the responsibility of Stabilame according to EN 15804:A2 and additional requirements from NBN/DTD B 08-001.

SOFTWARE
For the calculation of the LCA results, the software program Simapro version 9.1.0.7 has been used.

INFORMATION ON ALLOCATION
A wood briquette co-product economic allocation has been used for the wood raw materials, according to the market price of wood briquettes and glued CLT. Meanwhile, the allocations of the background database are remaining unchanged.

INFORMATION ON CUT OFF
The company reported the data. Some plausibility and completeness assessments and checks were conducted for some inputs. For a few remaining data, no comprehensive assessment was conducted, therefore accepting data gaps. In all cases, it is assumed that the cut-off criteria of EN 15804 are met.

INFORMATION ON EXCLUDED PROCESSES
Following processes were excluded for the inventory:

- The effects of capital goods and infrastructural processes have been excluded.
- Flows related to human activities such as employee transport and administration activity are also excluded.

INFORMATION ON BIOGENIC CARBON MODELLING
Cross-laminated timber products are mainly made of wood, with high biogenic carbon content. As long as the cross-laminated timber is in use, this carbon is stored in the product. For the CLT materials, biogenic CO_2 is assessed based on the following formula and is provided in the overall LCA results. Global Warming Potential impacts excluding biogenic CO2 emissions are also provided in a separate indicator.

$$CO2\ content\ (kg\ in\ air) = wood\ content * (1 - u) *\ carbon\ content * 3.67\ (mol\ ratio\ CO2 - C)$$

Where u = 13% humidity and carbon content = 0.5

The packaging does not contain any biogenic carbon.

	Biogenic carbon content (kg C / FU)
Biogenic carbon content in the product (at the gate)	204.32
Biogenic carbon content in accompanying packaging (at the gate)	0

INFORMATION ON CARBON OFFSETTING
Carbon offsetting is not allowed in the EN 15804 and hence not taken into account in the calculations.

ADDITIONAL OR DEVIATING CHARACTERISATION FACTORS
The characterisation factors from EC-JRC were applied. No additional or deviating characterisation factors were used.

DESCRIPTION OF THE VARIABILITY
Glued cross laminated timber can be produced in a thickness range of 80 – 200 mm.
The reference product of this B-EPD is a glued CLT with 5 layers and 160mm, composed by 3 wood layers of 40 mm and 2 wood layers of 20 mm, and 4 assemblings with glue and hardener.
The main differences between the products with different thickness are the wood layer thickness and the number of assemblings with glue and hardener.
The entire range of products can use the results from this B-EPD, using a linear conversion factor.

DATA

SPECIFICITY
The data used for the LCA are specific for this product which is manufactured by a single manufacturer in a single production site (Stabilame).

PERIOD OF DATA COLLECTION
Manufacture-specific data have been collected for the year 2019.

INFORMATION ON DATA COLLECTION
No adaptations of the data were found necessary.

DATABASE USED FOR BACKGROUND DATA
Ecoinvent version 3.6 was used, released in September 2019.

ENERGY MIX
The Belgian energy mix is considered for the manufacturing and the installation of the product in the building.
The benefits beyond the system boundaries (module D) are assessed based on the Belgian energy mix.

PRODUCTION SITES

Stabilame – Mariembourg, Belgium.

SYSTEM BOUNDARIES

Product stage			Construction installation stage		Use stage							End of life stage					Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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 = included in the EPD
MND = module not declared

POTENTIAL ENVIRONMENTAL IMPACTS PER 1M^3 OF GLUED CLT

	Production			Construction process stage		Use stage							End-of-life stage				D Reuse, recovery, recycling
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
GWP total (kg CO2 equiv/FU)	-9.92E+02	8.84E+00	3.29E+02	4.58E+00	2.16E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.16E+00	3.15E+00	5.69E+02	1.88E+02	-2.74E+01
GWP fossil (kg CO2 equiv/FU)	3.86E+01	8.84E+00	4.58E+01	4.58E+00	2.16E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.16E+00	3.15E+00	6.50E+00	0.00E+00	-2.71E+01
GWP biogenic (kg CO2 equiv/FU)	-1.03E+03	6.20E-04	2.83E+02	3.21E-04	3.51E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.13E-05	2.21E-04	5.63E+02	1.88E+02	-1.21E-01
GWP luluc (kg CO2 equiv/FU)	1.66E+00	7.01E-05	5.70E-02	3.63E-05	2.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-05	2.49E-05	6.08E-04	0.00E+00	-1.96E-01
ODP (kg CFC 11 equiv/FU)	7.82E-06	2.05E-06	6.76E-06	1.06E-06	2.09E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.59E-07	7.30E-07	2.28E-07	0.00E+00	-4.49E-06
AP (kg SO2 equiv/FU)	2.86E-01	2.41E-02	1.02E-01	1.25E-02	7.82E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.84E-03	8.58E-03	2.05E-02	0.00E+00	-7.53E-02
EP - freshwater (kg (PO4)3- equiv/FU)	1.06E-02	5.26E-06	7.09E-04	2.72E-06	1.51E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.00E-07	1.87E-06	1.06E-05	0.00E+00	-1.35E-03
EP - marine (kg (PO4)3- equiv/FU)	1.02E-01	6.40E-03	2.87E-02	3.31E-03	2.74E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.37E-03	2.28E-03	9.97E-03	0.00E+00	-2.67E-02
EP - terrestrial (kg (PO4)3- equiv/FU)	1.17E+00	7.07E-02	3.40E-01	3.66E-02	3.01E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E-02	2.52E-02	1.07E-01	0.00E+00	-2.93E-01
POCP (kg Ethene equiv/FU)	6.56E-01	2.06E-02	9.61E-02	1.07E-02	8.28E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-02	7.33E-03	2.63E-02	0.00E+00	-1.10E-01

ADP Elements (kg Sb equiv/FU)	1.74E-05	3.15E-07	7.45E-06	1.63E-07	2.18E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.05E-08	1.12E-07	6.16E-06	0.00E+00	-4.81E-06
ADP fossil fuels (MJ/FU)	7.43E+02	1.25E+02	1.20E+03	6.49E+01	2.24E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+01	4.46E+01	2.38E+01	0.00E+00	-6.70E+02
WDP (m^3 water eq deprived /FU)	3.33E+01	-2.76E-02	8.90E+00	-1.43E-02	3.81E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.09E-03	-9.82E-03	-1.27E+00	0.00E+00	-4.84E+00

GWP total = total Global Warming Potential (Climate Change); GWP-luluc = Global Warming Potential (Climate Change) land use and land use change; ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels; WDP = water use (Water (user) deprivation potential, deprivation-weighted water consumption)

RESOURCE USE

	Production			Construction process		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
PERE (MJ/FU, net calorific value)	5.38E+01	1.26E-01	5.17E+02	6.53E-02	4.43E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-02	4.49E-02	6.20E-01	0.00E+00	-1.90E+01
PERM (MJ/FU, net calorific value)	4.70E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT (MJ/FU, net calorific value)	4.76E+03	1.26E-01	5.17E+02	6.53E-02	4.43E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E-02	4.49E-02	6.20E-01	0.00E+00	-1.90E+01
PENRE (MJ/FU, net calorific value)	7.82E+02	1.22E+02	1.29E+03	6.34E+01	2.21E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E+01	4.36E+01	2.53E+01	0.00E+00	-7.22E+02
PENRM (MJ/FU, net calorific value)	0.00E+00	0.00E+00	5.76E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

PENRT (MJ/FU, net calorific value)	7.82E+02	1.22E+02	1.30E+03	6.34E+01	2.21E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E+01	4.36E+01	2.53E+01	0.00E+00	-7.22E+02
SM (kg/FU)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF (MJ/FU, net calorific value)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF (MJ/FU, net calorific value)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW (m^3 water eq/FU)	8.84E-01	8.03E-05	2.67E-01	4.16E-05	7.71E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.48E-05	2.86E-05	-2.37E-02	0.00E+00	-1.37E-01

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 = Net use of fresh water

WASTE CATEGORIES & OUTPUT FLOWS

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Hazardous waste disposed (kg/FU)	7.67E-01	3.95E-03	7.55E-01	2.04E-03	5.59E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.02E-04	1.40E-03	1.26E+00	0.00E+00	-2.13E-01
Non-hazardous waste disposed (kg/FU)	2.37E+00	4.36E-02	4.84E+00	2.26E-02	6.85E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.69E-03	1.55E-02	7.95E-02	0.00E+00	-2.42E+00
Radioactive waste disposed (kg/FU)	4.84E-03	9.08E-04	8.79E-03	4.70E-04	9.55E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-04	3.23E-04	1.43E-04	0.00E+00	-4.52E-03
Components for re-use (kg/FU)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (kg/FU)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.45E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.52E+02	0.00E+00	0.00E+00
Materials for energy recovery (kg/FU)	0.00E+00	0.00E+00	1.30E+02	0.00E+00	9.34E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E+02	0.00E+00	0.00E+00
Exported energy heat (MJ/FU)	0.00E+00	0.00E+00	1.30E+03	0.00E+00	8.84E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E+01	0.00E+00	0.00E+00
Exported energy electricity (MJ/FU)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.49E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E+01	0.00E+00	0.00E+00

IMPACT CATEGORIES ADDITIONAL TO EN 15804

		Production			Construction process		Use stage							End-of-life stage				
		A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
	PM (disease incidence)	1.66E-05	5.43E-07	4.03E-06	2.81E-07	1.35E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E-07	1.93E-07	2.77E-07	0.00E+00	-1.23E-06
	IRHH (kg U235 eq/FU)	4.84E+00	5.52E-01	1.03E+01	2.86E-01	7.61E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.95E-02	1.96E-01	1.37E-01	0.00E+00	-5.10E+00
	ETF (CTUe/FU)	1.29E+03	5.04E+01	6.83E+02	2.61E+01	5.99E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.39E+00	1.79E+01	1.76E+01	0.00E+00	-2.53E+02
	HTCE (CTUh/FU)	1.78E-07	6.85E-10	1.15E-08	3.55E-10	1.00E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-09	2.44E-10	8.81E-09	0.00E+00	-6.82E-09
	HTnCE (CTUh/FU)	1.62E-06	8.10E-08	4.01E-07	4.19E-08	1.16E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.33E-09	2.88E-08	2.28E-07	0.00E+00	-2.05E-07
	Land Use Related impacts (dimension less)	2.59E+04	3.11E-01	2.10E+02	1.61E-01	-2.18E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.54E-02	1.11E-01	2.60E+00	0.00E+00	-2.01E+04

HTCE = Human Toxicity – cancer effects; HTnCE = Human Toxicity – non cancer effects; ETF = Ecotoxicity – freshwater; (potential comparative toxic unit)
PM = Particulate Matter (Potential incidence of disease due to PM emissions);
IRHH = Ionizing Radiation – human health effects (Potential Human exposure efficiency relative to U235);

	Global Warming Potential	*The global warming potential of a gas refers to the total contribution to global Warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.* *It is split up in 4:* - *Global Warming Potential total (GWP-total) which is the sum of GWP-fossil, GWP-biogenic and GWP-luluc* - *Global Warming Potential fossil fuels (GWP-fossil) : The global warming potential related to greenhouse gas (GHG) emissions to any media originating from the oxidation and/or reduction of fossil fuels by means of their transformation or degradation (e.g. combustion, digestion, landfilling, etc).* - *Global Warming Potential biogenic (GWP-biogenic) : The global warming potential related to carbon emissions to air (CO2, CO and CH4) originating from the oxidation and/or reduction of aboveground biomass by means of its transformation or degradation (e.g. combustion, digestion, composting, landfilling) and CO2 uptake from the atmosphere through photosynthesis during biomass growth – i.e. corresponding to the carbon content of products, biofuels or above ground plant residues such as litter and dead wood.[1]* - *Global Warming Potential land use and land use change (GWP-luluc): The global warming potential related to carbon uptakes and emissions (CO2, CO and CH4) originating from carbon stock changes caused by land use change and land use. This sub-category includes biogenic carbon exchanges from deforestation, road construction or other soil activities (including soil carbon emissions).*
	Ozone Depletion	*Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.*
	Acidification potential	*Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.*
	Eutrophication potential	*The potential to cause over-fertilisation of water and soil, which can result in increased growth of biomass and following adverse effects.* *It is split up in 3:* - *Eutrophication potential – freshwater: The potential to cause over-fertilisation of freshwater, which can result in increased growth of biomass and following adverse effects.* - *Eutrophication potential – marine: The potential to cause over-fertilisation of marine water, which can result in increased growth of biomass and following adverse effects.* - *Eutrophication potential – terrestrial: The potential to cause over-fertilisation of soil, which can result in increased growth of biomass and following adverse effects.*
	Photochemical ozone creation	*Chemical reactions brought about by the light energy of the sun creating photochemical smog. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.*
	Abiotic depletion potential for non-fossil ressources	*Consumption of non-renewable resources, thereby lowering their availability for future generations. Expressed in comparison to Antimonium (Sb).* *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 experienced with the indicator.*
	Abiotic depletion potential for fossil ressources	*Measure for the depletion of fossil fuels such as oil, natural gas, and coal. The stock of the fossil fuels is formed by the total amount of fossil fuels, expressed in Megajoules (MJ).* *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 experienced with the indicator.*
	Ecotoxicity for aquatic fresh water	*The impacts of chemical substances on ecosystems (freshwater).* *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 experienced with the indicator.*
	Human toxicity (carcinogenic effects)	*The impacts of chemical substances on human health via three parts of the environment: air, soil and water.*

[1] Carbon exchanges from native forests shall be modelled under GWP - luluc (including connected soil emissions, derived products or residues), while their CO2 uptake is excluded.

		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 experienced with the indicator.
	Human toxicity (non-carcinogenic effects)	*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 experienced with the indicator.*
	Particulate matter	*Accounts for the adverse health effects on human health caused by emissions of Particulate Matter (PM) and its precursors (NOx, SOx, NH3)*
	Resource depletion (water)	*Accounts for water use related to local scarcity of water as freshwater is a scarce resource in some regions, while in others it is not.* *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 experienced with the indicator.*
	Ionising radiation - human health effects	*This impact category deals mainly with the eventual impact on human health of low dose ionising radiation of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionising radiation from the soil, from radon and from some construction materials is also not measured by this indicator.*
	Land use related impacts	*The indicator is the "soil quality index" which is the result of an aggregation of following four aspects:* - *Biotic production* - *Erosion resistance* - *Mechanical filtration* - *Groundwater* *The aggregation is done based on a JRC model. The four aspects are quantified through the LANCA model for land use.* *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 experienced with the indicator.*

DETAILS OF THE UNDERLYING SCENARIOS USED TO CALCULATE THE IMPACTS

A1 – RAW MATERIAL SUPPLY

The wood used for the manufacturing of glued CLT presents 13% of humidity, and comes from local sustainably managed forests. Co-products during manufacturing are counted in this module and represent 27.4% of wood input. Part of this wood is used to produce wooden briquettes as a co-product. Thus, the impacts are economically allocated based on market prices.
Glue and hardener coming from Germany are used to assemble the wooden boards. 11.6% glue and hardener losses during manufacturing are counted in this module.

A2 – TRANSPORT TO THE MANUFACTURER

Wood, glue and hardener are transported by truck, mass-based. Default Ecoinvent 3.6 data were used, considering 50% of "Transport, freight, lorry 16-32 metric ton, euro5 {RER}| transport, freight, lorry 16-32 metric ton, EURO5|Cut-off,U" and 50% of "Transport, freight, lorry 16-32 metric ton, euro6 {RER}| transport, freight, lorry 16-32 metric ton, EURO6|Cut-off,U".

A3 – MANUFACTURING

The manufacturing is composed of sawn, plan mills, scanning, finger-jointing, machining, and assembling processes. The glued CLT is packed.

Electricity is considered for all processes without any discrepancy. Production steps of glued CLT are modelled using overall electricity consumption, and heat from wood and natural gas.

Packaging used is polyethylene film, supplied from Belgium by truck 7.5-16 metric ton, mix euro5 and euro6. The packaging is not compulsory, depending on needs, weather, distances, etc. An average packaging given by Stabilame is considered.

A4 – TRANSPORT TO THE BUILDING SITE

Fuel type and consumption of vehicle or vehicle type used for transport	Truck 16-32 ton Mix Euro5 and Euro6
Distance	80 km
Capacity utilisation (including empty returns)	Default values from Ecoinvent 3.6
Bulk density of transported products	470 kg/m^3
Volume capacity utilisation factor	Default values from Ecoinvent 3.6

The transport scenario is modelled for the Belgium market. The primary data is given by Stabilame and takes into account the average distance of Belgium sales.

A5 – INSTALLATION IN THE BUILDING

At the construction site, packaging materials are treated at the end of life according to the NBN/DTD B 08-001:2017. Also, 10% of screw losses have been taken into account in this module.
As prefabricated elements, no losses of the main product is identified.

Parts of the installation	quantity	Description
Process necessary for the installation of the product	*0.0031kWh/m^2*	*The energy needed for the electric drill*
Process necessary for the installation of the product	*0.0441hr/m^2*	*Crane*
Fixation materials	*0.05 kg/m^2*	*Screws in electrogalvanized steel*
Material losses	*10%*	*The quantity of screw losses*
Packaging	*0.025 kg/m^2*	*PE film waste treatment at EoL*

B – USE STAGE (EXCLUDING POTENTIAL SAVINGS)

If installed correctly according to the manufacturers' and suppliers' guidelines, glued cross-laminated timber products need no further maintenance, repair, replacement or refurbishment during the full life span of the product. If the product is applied following the installation instructions, the life span of 100 years is applicable.

C: END OF LIFE

After a service lifetime of 100 years, the building is stripped for recoverable materials and products, and the remaining construction subsequently refurbished. The product can be removed separately from the parts of the construction. The valuable sorted materials are 75% recycled and 25% incinerated, according to Belgium default End of Life Scenario for non treated wood.

C1: dismantling does not require any electricity or other materials;
C2:default scenario from NBN/DTD B 08-001:2017;
C3: impacts of sorting and 25% of the product which is incinerated (efficiency higher than 60%)
C4: -

Module C2 – Transport to waste processing					
Type of vehicle (truck/boat / etc.)	Process	Distance (km)	Capacity utilisation (%)	Density of products (kg/m^3)	Assumptions
Transport, freight, lorry 16-32 metric ton, mix euro5 and euro6 {RER}	Sorting	30	85%	470 kg/m^3	Empty return 30%
Transport, freight, lorry 16-32 metric ton, mix euro5 and euro6 {RER}	Incineration	100	85%	470 kg/m^3	Empty return 30%

End-of-life modules – C3 and C4		
Parameter	Unit	Value
Wastes collected separately	kg	1
Wastes collected as mixed construction waste	kg	
Waste for re-use	kg	
Waste for recycling	kg	0.75
Waste for energy recovery	kg	0.25
Waste for final disposal	kg	

D – BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES

75% of the product is recycled. The benefits and loads are considered as beyond the system boundary and calculated in module D.
25% of the product is incinerated. The benefits of energy recovery are considered in module D. Credits are assigned to power and heat outputs using the Belgian grid mix and thermal energy from natural gas. The latter represents the cleanest fossil fuel and therefore results in a conservative estimate of avoided burdens. For regional efficiencies and heat-to-power output ratios, 25,56% is considered for avoided heat from natural gas and 13% is assumed for electricity production.

ADDITIONAL INFORMATION ON RELEASE OF DANGEROUS SUBSTANCES TO INDOOR AIR, SOIL AND WATER DURING THE USE STAGE

INDOOR AIR

Formaldehyde emissions

The product may be in contact with indoor air, depending on whether or not it's applied inside building with an exposed surface.

The product covered by this EPD has not been tested for the VOC emissions in the air

SOIL AND WATER

Not applicable as this product is not in contact with water and soil.

DEMONSTRATION OF VERIFICATION

EN 15804+A2 serves as the core PCR
Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010 Internal ☐ External ☒
Third party verifier: Evert Vermaut Vinçotte Jan Olieslagerslaan 35 B-1800 Vilvoorde evermaut@vincotte.be November 2020

ADDITIONAL INFORMATION ON REVERSIBILITY

Reversibility	- *Element level: reversible with light repairable damage (screws, bolts and dowels)* - *Material level: the layers of wood are glued together*
Simplicity of disassembly	- *complex - requires specific tools and/or several workers*
Speed of disassembly	- *very speedy disassembly*
Ease of handling (size and weight)	- *handling requires mechanical devices*
Robustness of material (material resistance to disassembly)	- *the material resists well during disassembly*

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- PEFC Certification; PEFC/07-32-181/2

General information

Owner of the EPD, Responsible for the data, LCA and information	**Stabilame** **Zoning Industriel – 5 Karting Street** **B-5660 Mariembourg** **Belgium** Tel : 003260310064 Mail : info@stabilame.be
EPD program Program operator Publisher of this EPD	B-EPD Federal Public Service of Health, Food Chain Safety and Environment Victor Hortaplein 40 bus 10 1060 Brussel België www.environmentalproductdeclarations.eu
Contact programma operator	epd@environment.belgium.be
Based on following PCR documents	EN 15804+A2:2019 NBN/DTD B 08-001 and its complement
PCR review conducted by	Federal Public Service of Health and Environment & PCR Review committee
Author(s) of the LCA and EPD	Dr Carolina SZABLEWSKI Dr Naeem ADIBI WeLOOP – info@weloop.org
Identification of the project report	Environmental Product Declaration Background Report Cross Laminated Timber V2.7
Verification	External independent verification of the declaration and data according to EN ISO 14025 and relevant PCR documents
Name of the third party verifier Date of verification	Evert Vermaut Vinçotte 01/12/2020
www.b-epd.be	**www.environmentalproductdeclarations.eu**

Comparing EPDs is not possible unless they are conform to the same PCR and taking into account the building context.
The program operator cannot be held responsible for the information supplied by the owner of the EPD nor LCA practitioner.

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