HIRSITALOTEOLLISUUS
FINNISH LOG HOUSE INDUSTRY

RTS EPD No. RTS_191_22

Laminated Log Wall Structure

Scope of the declaration

This environmental product declaration refers to the laminated log wall structures produced by the members of Finnish Log House Industry Association. The declaration has been prepared in accordance with EN 15804:2012+A2:2019 and ISO 14025 standards and the additional requirements stated in the RTS PCR 26.8.2020. This declaration includes the life cycle stages from cradle to gate with options, modules A4-A5, C1-C4 and module D.

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RTS EPD nro: RTS 191_22

EcoPlatform reference number:

Building Information Foundation RTS

Malminkatu 16 A, 00100 Helsinki

https://cer.rts.fi/en/rts-epd/fi

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Contents

GENERAL INFORMATION, DECLARATION SCOPE AND VERIFICATION

1. Owner of the declaration, manufacturer

Finnish Log House Industry Association
Seppo Romppainen
Kidekuja 2, 88610 Vuokatti
info@hirsikoti.fi

2. Product name and number

Laminated log wall structures. Building 2000 Product No: 246

3. Place of production

The average production data and assembly of the laminated log wall structures are based on the inventory of five representative members of the Finnish Log House Industry Association: Den Finland Oy Finnlamelli (Alajärvi), Honkarakenne Oyj (Karstula), Oy Primapoli Ltd Honkatalot (Töysä), Kontiotuote Oy (Pudasjärvi) and Pellopuu Oy (Pello).

4. Additional information

Seppo Romppainen, CEO. info@hirsikoti.fi

5. Product category rules and scope of the declaration

The declaration has been prepared in accordance with EN 15804 + A2:2019 and ISO 14025 standards and additional requirements stated in RTS PCR (Version, 26.8.2020). Product specific category rules have not been applied. EPD of construction products may not be comparable if they do not comply with EN 15804 and seen in a building context.

6. Author of the LCA and declaration

Tarmo Räty, Senior Scientist
Natural Resources Institute Finland (Luke),
Latokartanonkaari 9, 00790 Helsinki, Finland, www.luke.fi

7. Verification

This EPD has been verified according to the requirements of ISO 14025:2010, EN 15804 + A2:2019 and RTS PCR protocol by a third party. The verification has been carried out by Sigita Židonienė from Vesta Consulting, Lithuania.

8. Declaration issue date and validity

Declaration issue date 09. June 2022, EPD is valid 5 year from verification 03. June 2022–02. June 2027

European standard EN 15804:2012+ A2:2012 serves as the core PCR	
Independent verification of the declaration data, according to ISO 14025:2010	
☐ Internal	☒ External
Third party verifier:	

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PRODUCT INFORMATION

9. Product description

This EPD represents the production and assembly of the laminated log wall structures produced by members of Finnish Log House Industry Association. The structure contains laminated (glued) logs, connected with wooden dowels and metal fitting parts, sealing strips and insulation between the logs. Transportation and machine usage needed for assembly at the construction site are included. A laminated log is made of kiln dried dimensioned lumber of pine *(Pinus sylvestris L.)* or spruce *(Picea abies L.)* and glued together from two or more pieces, with either a vertical, horizontal or cross seams.

10. Results of environmental information, reported per kilogram

Table 10 Results of environmental information per kilogram of laminated log wall structure*.

Impact	Unit	A1-A3	A3	A4*	A5	C1	C2*	C3	C4	D
Climate change, (GWP-total)	kg CO2 eq./kg	-1,28E+00		7,43E-05	3,08E-02	6,73E-04	3,42E-05	1,61E+00	4,18E-02	-1,32E-01
Resource use, minerals and metals, (ADP-minerals&metals)	kg Sb eq./kg	5,88E-07		4,41E-11	1,50E-07	3,43E-10	2,75E-11	1,24E-09	2,45E-09	-1,13E-07
Resource use, fossils, (ADP-fossil)	MJ, net calorific value/kg	6,00E+00		1,14E-03	3,93E-01	9,15E-03	5,27E-04	8,31E-02	1,02E-02	-1,10E+00
Water use, (WDP)	m3 world eq. Deprived/kg	1,21E-01		1,83E-07	1,28E-02	1,30E-05	3,72E-06	6,36E-04	-2,78E-04	-1,96E-02
Biogenic carbon content in product	kg C/kg		4,47E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of secondary material	kg /kg	4,49E-04		0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,90E-01
*Reported per kg of transported km										

This EPD has average EPD data for GWP total – indicator, which differs more than 10% for the Den Finland Oy product with a small margin.

11. Description of product and its use

Laminated log wall structure is a basic element of a modern log house. Typical thickness of a laminated log is between 88 to 275 mm, regular height is 170 mm but can be up to 275 mm. This EPD is valid for an average laminated log wall structure with all widths. Log thickness or height has no considerable impact on the relative environmental load of the wall structure per volume.

12. Product standard

SFS 5973 Massive and laminated logs for buildings. Requirements

The quality requirements from Finnish Log House Industry are available from the EPD owner or:
http://www.hirsikoti.fi/assets/images/HTT_standardit/Laatuvaatimukset_HTT/QUALITY_REQUIREMENTS_FOR_LOG_BUILDINGS_eng.pdf

13. Physical properties

The laminated log wall structure with assembly parts weights 484 kg/m3. The laminated logs density is 475 kg/m3 in 12 % moisture (u=12%).

14. Raw materials of the laminated log wall structure

Product raw materials	Amount	Usability	Origin
Wood Scots pine (*Pinus sylvestris L*) or Norway spruce (*Picea abies L*)	98,2%*	Renewable	Finland
Metal parts in the structure	1,8 w/w -%	Recyclable	Finland
Resin	< 1 w/w -%	Non-renewable	Europe, Finland
Sealings and barrier materials	< 1 w/w -%	Non-renewable	Europe
*Inventoried shares of production volumes are pine 73% and spruce 27 %. A product is made either on pine or spruce			

Either 1-component Polyurethane (PUR) or Melamine Urea Formaldehyde (MUF) resin is used.

15. Substances under European Chemicals Agency`s REACH, SVHC restrictions

Laminated log wall structure does not include substances from ECHA's Candidate List of Substances of Very High Concern.

SCOPE OF THE LIFE CYCLE ASSESSMENT

All covered modules are marked with X. Not relevant modules are marked as NR. This declaration covers "cradle-to-gate with options, modules A4-A5, C1-C4 and D".

Product stage (A1-A3)			Construction process stage (A4-A5)		Use stage (B)							End of life stage (C)				Supplementary information beyond the life cycle (D)		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D1	D2	D3
X	X	X	X	X	NR	NR	NR	NR	NR	NR	NR	X	X	X	X	X	X	NR
Raw material supply	**Transport**	**Manufacturing**	**Transport**	**Construction-instsallation process**	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	**De-construction demolition**	**Transport**	**Waste processing**	**Disposal**	**Reuse**	**Recovery**	Recycling

This environmental product declaration refers to the log wall structures produced in Finnish mills. Scenario for the modules C and D are valid for processing demolition wood and reusing in Finland only.

The reference year is 2020.

16. Declared unit

Declared unit is one m^3 of log wall structure with 12 % moisture content, including the necessary parts for assembly.

The functionality of the wall structure depends on the thickness of the structure and possible additional structures used depending on the intended use. Results can be converted per m2 by multiplying with log thickness.

Product	m3/m	m/m3	Product	m3/m	m/m3	Product	m3/m	m/m3
Spruce 14X95	1,70E-03	588	Pine 28x95	3,20E-03	313	Spruce 48x73	3,75E-03	267
Spruce 21x48	1,10E-03	909	Spruce 28x195	6,40E-03	156	Spruce 48x98	5,00E-03	200
Spruce 20x95	2,20E-03	455	Spruce 28x215	7,20E-03	139	Spruce 48x123	6,25E-03	160

The results are presented as production volume weighted averages of the five mills presenting a product on the market.

17. System boundaries

This EPD covers the following modules: A1 (raw material supply), A2 (transport) A3 (manufacture), A4 (transport to the site) and A5 (construction process), as well as a scenario for End-of-Life and supplementary information beyond life cycle module D).

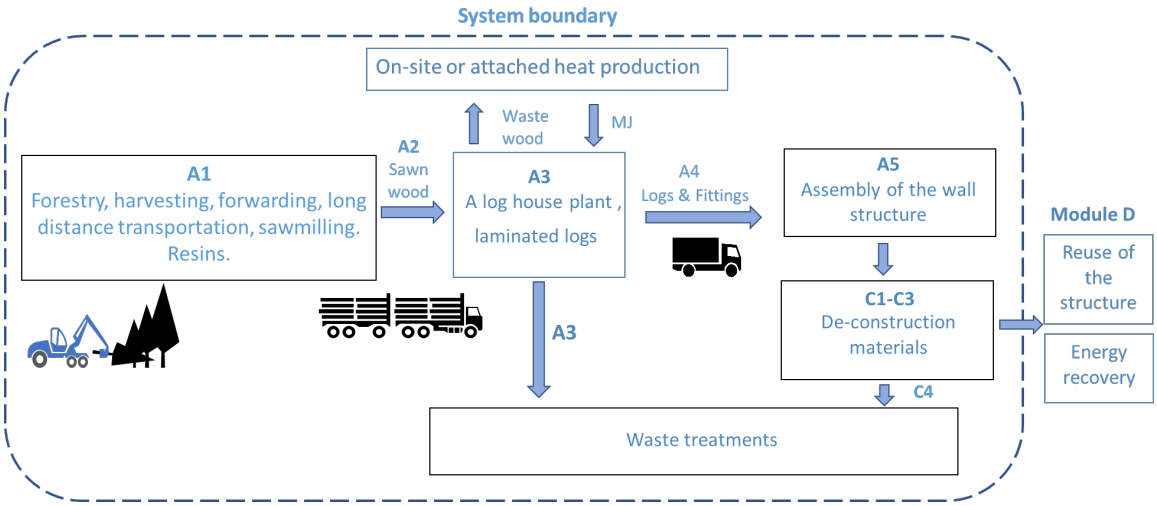
18. Cut-off criteria

Modules A1 is based on inventory of RTS EPD 124_21 over its modules A1 to A3. All the raw material transportation in A2 is inventoried. In module A3, all used materials, energy, packages and transportation until the end-of-waste state have been included. In module A4, transportation distance to the customer is with partially empty return. All inventories are based on ERP data from the mills. Possible unit processes of direct flows do not exceed 1% cut-off in amount or expected impacts. In module A5, only machine work needed for assembly of the wall structure is inventoried, no other

construction resources are included. Necessary fitting materials and sealings included in A5. A scenario for the module B is not presented in this EPD. In a scenario for the module C it is assumed that the de-constructed structure will be directed partly for reuse in module D, incinerated for energy and treated as waste. Metal parts are transported to recycling but considered recycled without burden. Module D considers the net benefits of using laminated logs in energy recovery and reusing material in a new building.

19. Production process

Raw materials (module A1) for laminated logs are sawn timber and adhesives used to laminate bords into logs. Both are transported to the mills using trucks (module A2). In A3 module, the production line finger-joints the pieces of sawn timber to the desired log lengths, laminates the boards into logs, planes for the producer specific profile and finally machines notched joints, dowel holes and other cuttings. The production process requires electricity and fuels for the different equipment, as well as hydraulic and lubrication oils. Production side streams, sawdust and cutter shavings, are either sold or used for process energy. The wall structure contains laminated logs, wooden dowels, metal fitting parts and sealing strips and insulation between the logs. Laminated logs and fittings are packed and transported to the customer (module A4). Light weight diesel-powered construction machines are used to lift the structure and fittings part assembled (module A5).



HIRSITALOTEOLLISUUS
FINNISH LOG HOUSE INDUSTRY

ENVIRONMENTAL IMPACTS AND RAW MATERIAL USE

20. Environmental impacts

Table 20 Environmental impacts of laminated log wall structure

Impact category	Unit	A1-A3	A4*	A5	C1	C2*	C3	C4	D
Climate change (GWP-total)	kg CO2 eq.	-6,09E+02	3,60E-02	1,49E+01	3,26E-01	1,66E-02	7,82E+02	2,02E+01	-6,41E+01
Climate change - Fossil (GWP-fossil)	kg CO2 eq.	1,18E+02	3,60E-02	1,41E+01	3,26E-01	1,66E-02	1,00E+00	4,08E-01	-2,41E+01
Climate change - Biogenic (GWP-biogenic)	kg CO2 eq.	-7,28E+02	1,38E-05	7,43E-01	1,21E-04	6,40E-06	7,81E+02	1,98E+01	-3,96E+01
Climate Change – Land use and LU change (GWP-luluc)	kg CO2 eq.	1,57E+00	1,65E-06	8,97E-02	3,22E-05	7,40E-07	3,83E-02	1,55E-04	-3,75E-01
Ozone depletion (ODP)	kg CFC 11 eq.	2,05E-05	9,06E-09	1,22E-06	6,90E-08	4,14E-09	1,62E-07	6,20E-08	-5,14E-06
Acidification (AP)	Mol H+ eq.	9,98E-01	8,88E-05	6,72E-02	1,81E-03	3,50E-05	3,13E-03	3,39E-03	-1,69E-01
Eutrophication, freshwater (EP-freswater)	kg P eq.	2,35E-02	4,63E-07	1,17E-03	1,00E-05	2,23E-07	3,56E-04	1,06E-04	-2,09E-03
Eutrohication, marine (EP-marine)	kg N eq.	3,76E-01	1,83E-05	1,46E-02	7,30E-04	5,36E-06	7,93E-04	1,86E-03	-6,39E-02
Eutrophiocation, terrestial (EP-terrestial)	mol N eq.	3,89E+00	2,01E-04	1,46E-01	8,01E-03	5,89E-05	5,99E-03	1,58E-02	-6,64E-01
Photochemical ozone formation (POCP)	kg NMVOC eq.	1,01E+00	6,38E-05	6,68E-02	2,27E-03	2,14E-05	1,99E-03	4,11E-03	-1,91E-01
Resource use, minerals and metals (ADP-minerals&metals)	kg Sb eq.	2,80E-04	2,14E-08	7,27E-05	1,66E-07	1,33E-08	6,02E-07	1,18E-06	-5,47E-05
Resource use, fossils (ADP-fossil)	MJ, net caloric value	2,86E+03	5,54E-01	1,90E+02	4,43E+00	2,55E-01	4,02E+01	4,94E+00	-5,31E+02
Water use (WDP)	m^3, world eq. deprived	5,76E+01	8,85E-05	6,21E+00	6,32E-03	1,80E-03	3,08E-01	-1,35E-01	-9,47E+00

*Reported per transported km

21. Additional Environmental impact indicators

Not declared

22. Use of natural resources

Table 22 Use of natural resources of laminated log wall structure									
Parameter	Unit	A1-A3	A4*	A5	C1	C2*	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	2,01E+03	1,08E-03	1,84E+01	1,92E-02	4,78E-04	8,99E+00	1,78E+02	-3,05E+02
Use of renewable primary energy resources used as raw materials	MJ	9,48E+03	3,92E-04	7,49E-01	5,69E-03	1,83E-04	-9,19E+03	2,84E+02	-9,13E+01
Total use of renewable primary energy resources	MJ	1,15E+04	5,54E-01	6,42E+01	2,49E-02	6,61E-04	9,20E+03	4,63E+02	-3,96E+02
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	2,86E+03	0,00E+00	1,68E-01	4,43E+00	2,55E-01	3,99E+01	4,94E+00	-5,12E+02
Use of non-renewable primary energy resources used as raw materials	MJ	2,89E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,81E+02	0,00E+00	-8,72E+01
Total use of non-renewable primary energy resources	MJ	3,15E+03	0,00E+00	0,00E+00	4,43E+00	2,55E-01	-2,41E+02	4,94E+00	-6,00E+02
Use of renewable secondary fuels	MJ	0,00E+00	1,56E-05	4,57E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels	MJ	0,00E+00	0,00E+00	2,21E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	m^3	4,67E+00	0,00E+00	0,00E+00	2,62E-04	7,22E-06	1,02E-01	-2,31E-03	-7,21E-01
Use of secondary materials	kg	2,14E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,40E+02
*Reported per transported km									

23. Biogenic carbon content

Table 23 Biogenic carbon content, Laminated log wall structure		
	Unit*	A3
Biogenic carbon content in product	kg C	2,13E+02
Biogenic carbon content in accompanying packaging	kg C	8,25E+00
*1 kg biogenic carbon is equivalent to 44/12 kg of biogenic CO2.		

24. 21. End of life – Waste

Table 25 Other environmental indicators, Laminated log wall structure									
Parameter	Unit	A1-A3	A4*	A5	C1	C2*	C3	C4	D
Hazardous waste disposed	kg	1,14E-01	0,00E+00	2,07E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-3,28E-01
Non-hazardous waste disposed	kg	1,48E-02	0,00E+00	2,17E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-3,26E+00
Radioactive waste disposed	kg	3,08E-04	0,00E+00	3,08E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-4,61E-05
*Reported per transported km									

25. Other environmental indicators

Table 25 Other environmental indicators, Laminated log wall structure									
Parameter	Unit	A1-A3	A4*	A5	C1	C2*	C3	C4	D
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,43E+02	0,00E+00	0,00E+00
Materials for recycling	kg	1,28E+00	0,00E+00	3,66E-03	0,00E+00	0,00E+00	8,52E+00	0,00E+00	-2,26E-01
Materials for energy recovery	kg	4,88E-01	0,00E+00	5,75E-04	0,00E+00	0,00E+00	3,19E+02	0,00E+00	-8,05E-02
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
*Reported per transported km									

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

26. Energy in the manufacturing phase

Table 26 Energy in the manufacturing phase, Laminated log wall structure		
	Quantity	Data Quality
A3 Electricity, CO2 emission kg CO2 eq. per kWh	1,50E-01	Finnish grid average 2016-2020

27. Additional technical information, transportation of products

Table 27 Transport to the building site, Laminated log wall structure		
Variable	Quantity	Data quality
Diesel g/km/m3	5,93E+00	LIPASTO, Full trailer 80% load factor
Distance, km	8,81E+02	Average road transportation, including abroad
Capacity utilisation (including empty returns)	5,07E+01	%, averaged
Bulk density of transported products, kgm^{-3}	4,84E+02	Including fitting parts (8,52E+00 kg)
Volume capacity utilisation factor	1	

28. End-of-life process description

Table 28 End-of-life process description, Laminated log wall structure		
Process flow	Unit	Share of declared unit
Collection process specified by type	Collected separately	97%
	Collected with mixed construction waste	3 %
Recovery system specified by type	Components for reuse	30%
	Material for recycling	0 %
	Energy recovery	67%
Disposal specified by type	Loss (mixed waste)	3 %
Assumptions for scenario development	Quality ratio for reuse 50%. Transportation distance to recovery and reuse 50 km.	

29. Additional information on release of dangerous substances to indoor air, soil and water during the use stage

Air, soil and water impacts during the use phase have not been studied.

30. References

Finnish Log House Association and Luke (2022). LCA Report of Laminated Log Wall Structure. Confidential Appendix to RTS EPD of Laminated Log Wall Structure, dated 2.6.2022.

Standards:

ISO 14025:2010 Environmental labels and declarations. Type III environmental declarations. Principles and procedures

ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.

ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.

EN15804:2012+A2:2019 Sustainability of construction works. Environmental Product Declarations. Core rules for the product category of construction products.

RTS PCR 26.8.2020 RTS PCR protocol. Building Information Foundation sr, PT 18 RT EPD Committee

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