

Laminated log wall structures of Norway spruce and Scots pine

RTS EPD 31_19

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 + A1 and ISO 14025 standards and the additional requirements stated in the RTS PCR protocol. This declaration includes the life cycle stages from cradle to gate with options, which are transportation to the construction site (A4), construction process (A5), waste processing (C3) and disposal (C4) and recovery (D).

RAKENNUSTIETO

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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. Finnish Log House Industry Association. Building 2000 Product Class 246

3. Place of production

The average production data and assembly of the laminated log wall structures are based on the survey of five representative members of the Finnish Log House Industry Association. Inventories are created from Finn-lamelli Oy (Alajärvi), Honkarakenne Oyj (Karstula), Oy Primapoli Ltd (Töysä), Kontiotuote Oy (Pudasjärvi) and Pellopuu Oy (Pello).

4. Additional information

Seppo Romppainen (info@hirsikoti.fi)

5. Product category rules and scope of the declaration

This EPD has been prepared in accordance with EN 15804 + A1 and ISO 14025 standards together with the RTS PCR (Version, 2.6.2016). Product specific category rules have not been applied in this EPD. EPD of construction products may not be comparable if they do not comply with EN 15804.

Environmental impacts and raw material use for the modules A1 and A2 are obtained from RTS-EPD RTS_27_19 Finnish sawn dried timber of spruce or pine (dated 25.2.2019).

6. Author of the LCA and declaration

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7. Verification

This EPD has been verified according to the requirements of ISO 14025:2010, EN 15804

+ A1 and RTS PCR protocol by a third party. The verification has been carried out by Vahanen Environment Ltd, Eng (UAS) Teija Kämpynen.

8. Declaration issue date and validity

This EPD is verified 27.6.2019. EPD is valid for 5 years, until 27.6.2024.

European standard EN 15804:2012 A1 serves as the core PCR^a

Independent verification of the declaration data, according to ISO 14025:2010

☐ Internal

☒ External

Vahanen Environment Oy,
B Eng. Teija Kämpynen

(b) Third party verifier:



^a Product category rules

^b Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010 9.4.)

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 connecting parts, sealing strips and insulation between the logs. Transportation and machine usage needed for assembly at the construction site are included. The 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.

This EPD is made for an average product of five producers. The average product is calculated weighted with the production volumes of the producers.

10. Technical specifications

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.

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

11. Product standard

SFS 5973 Massive and laminated logs for buildings. Requirements

12. Physical properties

The laminated log wall structure has average moisture content and density 14 % and 441 kg/m³ respectively (dry density 403kg/m³).

13. Raw materials of the product

Product raw-material	Amount, %
Softwood, pine (<i>Pinus sylvestris</i> L.) or spruce (<i>Picea abies</i> L.)	100

The choice of tree has no impacts on results.

Either 1-component Polyurethane (PUR) or Melamine Urea Formaldehyde (MUF) glue is used. The amounts of glue, connecting parts and sealing strips are each less than 1 % by weight of the laminated log wall structure.

14. 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.

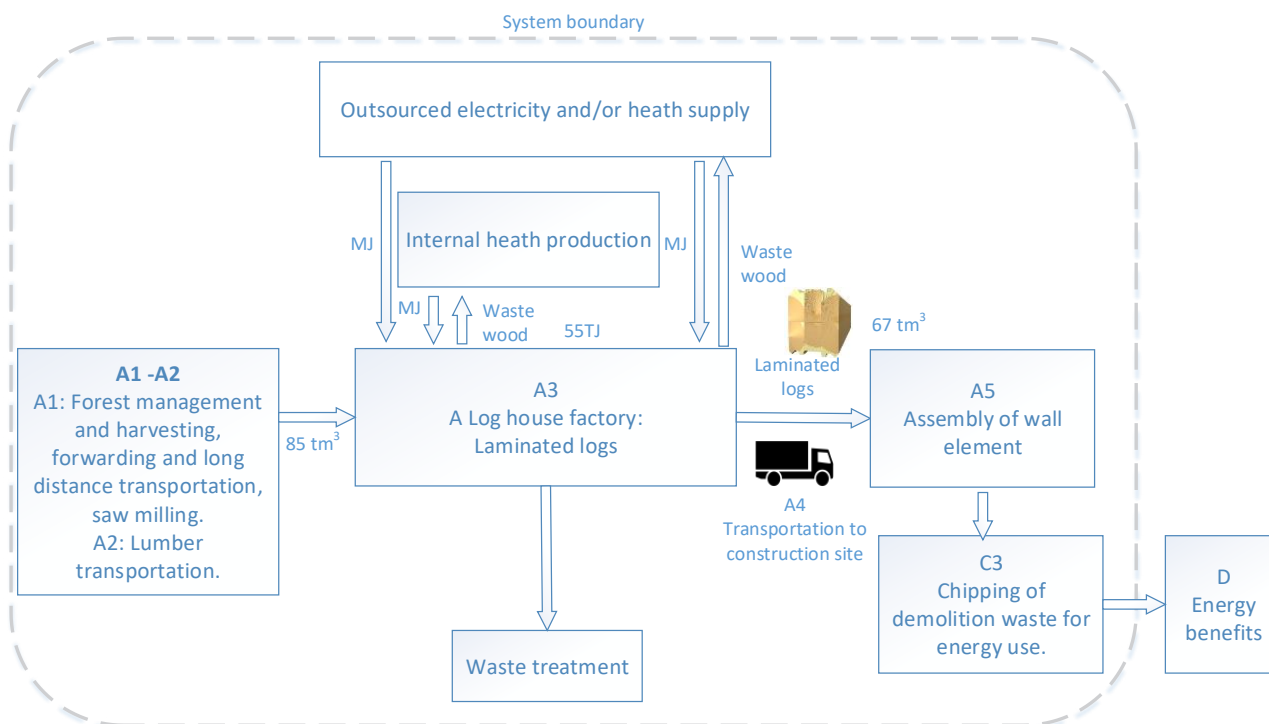


15. Declared unit

Declared unit is one m³ product with 14 % moisture content. Results can be converted per m² by multiplying with log thickness.

16. 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 C3 (waste processing) and C4 (disposal). In addition, module D – benefits and loads beyond the system boundary – have been included.



17. Cut-off criteria

In modules A1, A2 and A3, all used materials, energy, packages and transportation until the end-of-waste state have been included. In module A4, transportation distance is 406 km (average distance of different producers in Finland) with partially empty return. In module A5, energy and materials used in construction are included. Module B has not been studied in this EPD (PCR provisions are met). Module C includes assumption that laminated logs are used in energy recovery after initial use, i.e. module C4 is not relevant. In module C3, waste processing is assumed to be chipping, such that energy consumption for chipping is included. Also, carbon release from wood incineration is included to the module C3. Module D considers the benefits of using timber in energy recovery.

18. Production process

Saw logs are sawn and cut to dimensions at saw mill, kiln dried and transported to the log house factory. The production line finger-joints the pieces of sawn timber to the desired log lengths, glues the pieces into logs, planes for the producer specific profile and finally machines notched joints, dowel holes and other cuttings. Logs are packed for transportation to the construction site. The wall structure contains laminated logs, wooden dowels, metal connecting parts and sealing strips and insulation between the logs. The production process requires electricity and fuels for the different equipment, as well as hydraulic and lubrication oils.



Inventories do not cover possible other main products, e.g. round log production. Allocation between different main products is based mainly on measured data from the production site. In cases where measured data was not available, allocation is based on production volumes. Side streams; sawdust, cutter shavings and log stumps are either sold or used internally for energy. Allocation between main products and side streams is based on their economic value.

Scope of the Life Cycle Assessment

All covered modules are marked with X. Also marks MND (module not declared) and MNR (module not relevant) are used. This declaration covers “cradle-to-gate with options”.

Product stage			Construction process stage		Use Stage							End of life stage				Benefits and loads beyond the system boundary		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	MNR	X	MNR
Raw material supply	Transport	Manufacturing	Transport	Construction process	Use	Maintenance	Repair	Replacement	Refurbishment	Energy use	Water use	Demolition	Transport	Waste processing	Disposal	Re-use	Recovery	Recycling

Environmental impacts and raw material use

19. Environmental impacts (A1-A3)

Environmental impacts per declared unit (m ³ of logwood element in 14 % moisture content)					
Parameter	Unit	A1*	A2*	A3	A1-A3
Global warming, excluding biogenic impacts	kg CO ₂ eq	88,2	10,9	59,6 (3,87)	159 (3,87)
Global warming, including biogenic impacts	kg CO ₂ eq				-542** (3,87)
Depletion of stratospheric ozone layer	kg CFC 11 eq	1,50E-05	1,99E-06	5,05E-06 (2,65E-07)	2,21E-05 (5,63E-07)
Acidification potential of soil and water	kg SO ₂ eq	0,517	0,0370	0,219 (0,0110)	0,773 (0,0187)
Eutrophication potential	kg PO ₄ eq	0,123	0,0120	0,0682 (0,0057)	0,204 (0,00738)
Formation of photochemical ozone	kg C ₂ H ₄ eq	0,0369	0,00200	0,0128 (5,19E-04)	0,0522 (0,00119)
Abiotic depletion potential for non-fossil resources	kg Sb eq	5,97E-05	1,551E-05	7,62E-05 (1,05E-05)	1,51E-04 (1,14E-05)
Abiotic depletion potential for fossil resources	MJ	1 480	169	1040 (71,7)	2680 (94,6)
*Environmental impacts in modules A1 and A2 are based on RTS-EPD RTS_27_19 (dated 25.2.2019).					
**Biogenic carbon stock in the declared unit is 701 kg/m ³					
Standard error of the mean in parenthesis					

19. Environmental impacts (A4-D)

Environmental impacts per declared unit (m ³ of logwood element in 14 % moisture content)						
Parameter	Unit	A4	A5	C3	C4	D
Global warming, excluding biogenic impacts	kg CO ₂ eq	15,1 (1,14)	8,9		0	
Global warming, including biogenic impacts	kg CO ₂ eq	15,1 (1,14)	8,9	701**	0	-657*
Depletion of stratospheric ozone layer	kg CFC11eq	2,83E-06 (2,08E-07)	6,76E-07	5,06E-07	0	-
Acidification potential of soil and water	kg SO ₂ eq	0,0646 (0,00509)	0,0720	0,0195	0	-
Eutrophication potential	kg PO ₄ eq	0,0152 (0,0012)	0,0241	0,0286	0	-
Formation of photochemical ozone	kg C ₂ H ₄ eq	0,00262 (1,97E-04)	0,00694	8,85E-04	0	-
Abiotic depletion potential for non-fossil resources	kg Sb eq	1,63E-05 (1,08E-06)	9,61E-05	9,21E-07	0	-
Abiotic depletion potential for fossil resources	MJ	234 (17,4)	109	66,4	0	-
*Module D includes the emission of greenhouse gases from avoided combustion of peat.						
**Biogenic carbon storage of the declared unit.						
Standard error of the mean in parenthesis						



20. Use of natural resources

Resource use per declared unit (m ³ of logwood element in 14 % moisture content)					
Parameter	Unit	A1*	A2*	A3	A1-A3
Renewable primary energy resources used as energy carrier	MJ	16 300	3,16	343 (21,5)	16700 (346)
Renewable primary energy resources used as raw materials	MJ	8 120	0	435 (166)	8550 (152)
Total use of renewable primary energy resources	MJ	24 500	3,16	777 (166)	25200 (425)
Non-renewable primary energy resources used as energy carriers	MJ	2180	174	907 (52,3)	3260 (75,1)
Non renewable primary energy resources used as raw materials	MJ	0	0	176 (35,0)	176 (35,0)
Total use of non renewable primary energy resources	MJ	2180	174	1080 (82,6)	3440 (110)
Use of secondary material	kg	0	0	0	0
Use of renewable secondary fuels	MJ	0	0	0	0
Use of non renewable secondary fuels	MJ	0	0	0	0
Net use of fresh water	m ³	1,15	0	1,49 (0,0295)	2,91 (0,0295)
*Resource use in modules A1 and A2 are based on RTS-EPD RTS_27_19 (dated 25.2.2019). Standard error of the mean in parenthesis					

Resource use per declared unit (m ³ of logwood element in 14 % moisture content)						
Parameter	Unit	A4	A5	C3	C4	D
Renewable primary energy resources used as energy carrier	MJ	0	0	0	0	-
Renewable primary energy resources used as raw materials	MJ	0	17	0	0	-
Total use of renewable primary energy resources	MJ	0	17	0	0	-
Non-renewable primary energy resources used as energy carriers	MJ	199 (14,9)	8	47	0	-
Non renewable primary energy resources used as raw materials	MJ	0	4	0	0	-
Total use of non renewable primary energy resources	MJ	199 (14,9)	12	47	0	-
Use of secondary material	kg	0	0	0	0	-
Use of renewable secondary fuels	MJ	0	0	0	0	-
Use of non renewable secondary fuels	MJ	0	0	0	0	-
Net use of fresh water	m ³	0	0	0	0	-
Standard error of the mean in parenthesis.						

21. End of life – Waste

Waste per declared unit (m ³ of logwood element in 14 % moisture content)					
Parameter	Unit	A1 *	A2*	A3	A1-A3
Hazardous waste disposed	kg	0,0492	0	0,0935 (9,35E-03)	0,143 (9,35E-03)
Non hazardous waste disposed	kg	5,26	0	0,167 (0,156)	5,42 (0,156)
Radioactive waste disposed	kg	0	0	0	0
*Waste production in modules A1 and A2 are based on RTS-EPD RTS_27_19 (dated 25.2.2019). Standard error of the mean in parenthesis.					

Waste per declared unit (m³ of logwood element in 14 % moisture content)						
Parameter	Unit	A4	A5	C3	C4	D
Hazardous waste disposed	kg	0	0	0	0	-
Non hazardous waste disposed	kg	0	0	0	0	-
Radioactive waste disposed	kg	0	0	0	0	-

22. End of life – Output flows

Output flow per declared unit (m ³ of logwood element in 14 % moisture content)					
Parameter	Unit	A1*	A2*	A3	A1-A3
Components for re-use	kg	0	0	0	0
Materials for recycling	kg	0	0	1,08 (2,55E-01)	1,08 (2,55E-01)
Materials for energy recovery	kg	0	0	0,34 (1,09E-01)	0,34 (1,09E-01)
Exported energy	MJ	0	0	0	0
*Output flow in modules A1 and A2 are based on RTS-EPD RTS_27_19 (dated 25.2.2019). Standard error of the mean in parenthesis.					

Output flow per declared unit (m³ of logwood element in 14 % moisture content)						
Parameter	Unit	A4	A5	C3	C4	D
Components for re-use	kg	0	0	0	0	-
Materials for recycling	kg	0	0	0	0	-
Materials for energy recovery	kg	0	0	441	0	-
Exported energy	MJ	0	0	0	0	-

Scenarios and additional technical information

23. Energy in the manufacturing phase

Object	Value	Data quality
A3 data quality of electricity and CO ² emissions kg CO ² eq./kWh	223	Based on Finnish fuel mix used for electricity production in years 2013-2017 (5 years average) from Statistics Finland. Imported electricity has been considered. The environmental impacts of fuels are based on Ecoinvent database. The impacts include all upstream processes as well as transmission losses. Environmental impacts of electricity produced from wood and peat are based on typical Finnish CHP-plant.
A3 data quality of heating and CO ² emissions kg CO ² eq./kWh	0,012	Based on Ecoinvent database process, wood chips from industry used in 1 MW plant.

24. Transportation of products

Object	Value	Data quality
Vehicle type used for transport and CO ² emissions kg CO ² eq./tkm	0,90	Ecoinventin prosessi: Transport, freight, lorry >32 metric ton, EURO4 {GLO} market for APOS, S
Transport distance, km	406	Average distance in Finland
Empty return, %	50	Assumption that 50% of return is empty
Dry density of products, kg/m ³	403	In oven dry condition
Volume capacity utilization factor	1	

25. End-of-life process description

100% of the waste is collected separately and recovered as energy.

Processes	Unit (per declared unit)	Amount, kg/kg Data quality
Collection process specified by type	kg collected separately	1
	kg collected with mixed construction waste	-
Recovery system specified by type	kg for re-use	-
	kg for recycling	-
	kg for energy recovery	1
Disposal specified by type	kg product or material for final deposition	-

26. 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.

27. Bibliography

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+A1 Sustainability of construction works. Environmental Product Declarations. Core rules for the product category of construction products.
- EN 16485:2014 Round and sawn timber - Environmental Product Declarations - Product category rules for wood and wood-based products for use in construction
- RTS PCR 2.6.2016 RTS PCR protocol. Building Information Foundation sr, PT 18 RT EPD Committee

Others:

Frischknecht R., Jungbluth N., Althaus H.-J., Doka G., Dones R., Heck T., Hellweg S., Hirschier R., Nemecek T., Rebitzer G. and Spielmann M., 2005, The ecoinvent database: Overview and methodological framework, International Journal of Life Cycle Assessment 10, 3–9.

Kuittinen m. and Linkosalmi L. (2015). Compiling environmental product declarations for wood-based construction products. Aalto University Publication Series CROSSOVER. Publisher: Department of Architecture of the Aalto University School of Arts, Design and Architecture, Helsinki. ISBN 978-952-60-3703-5 (pdf).

Puutuoteteollisuus ry, 25.2.2019. RTS EPD ENVIRONMENTAL PRODUCT DECLARATION, No. RTS_27_19, Finnish sawn dried timber of spruce or pine, In accordance with EN 15804 and ISO 14025.

Official Statistics of Finland (OSF): Production of electricity and heat [e-publication]. ISSN=1798-5099. Helsinki: Statistics Finland [referred: 22.9.2017]. Access method: http://www.stat.fi/til/salatuo/index_en.html

Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, 21(9), pp.1218–1230.