

Environmental Product Declaration



Log and Timber
Homes Council

A Cradle-to-Gate EPD of Milled log wall products (MLW)



According to
ISO 21930
ISO 14025
ISO 14040/44



Summary Results –per m ³ Full Results in Table 1		Cradle-to-Gate Total
Global warming potential	kg CO ₂ e	1.43E+02
Acidification potential of soil and water sources	kg SO ₂ e	8.45E-01
Eutrophication potential	kg Ne	2.27E-01
Depletion potential of the stratospheric ozone layer	kg CFC11e	3.14E-05
Formation potential of tropospheric ozone	kg O ₃ e	1.72E+01
Abiotic depletion potential (ADP _{fossil}) for fossil resources	MJ, NCV	1.98E+03
Global warming potential – TRACI 2.1	kg CO ₂ e	1.43E+02
Acidification potential of soil and water sources	kg SO ₂ e	8.45E-01

1.0 General Information

EPD Program and Program Operator	ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken, PA, 19428-2959 USA www.astm.org  ASTM INTERNATIONAL Helping our world work better
General Program Instructions and Version Number	ASTM Program Operator for Product Category Rules (PCR) and Environmental Product Declarations (EPDs) - General Program Instructions, version: 6.0
Manufacturer	National Association of homebuilders National Housing Center 1201 15th Street, NW Washington, DC 20005 https://nwfa.org  Log and Timber Homes Council
Declaration Number	EPD xxx
Declared Product	Milled log wall products (MLW)
Declared Unit	1 m ³ of MLW produced.
Reference PCR and Version Number	ISO 21930:2017 Sustainability in Building Construction — Environmental Declaration of Building Products. [7] ISO 14040/44:2006 Underwriters Laboratory, Product Category Rule for Architectural and Structural Wood Products. Version 1.1. (2020)
Markets of Applicability	Construction Sector, Building homes
Date of Issue	dd.mm.2024

Period of Validity	dd.mm.2029		
EPD Type	Industry Average EPD		
EPD Scope	Cradle-to-Gate		
Year of reported manufacturer primary data	2019		
LCA Software	SimaPro v9.2		
LCI Databases	USLCI, Ecoinvent 3.9 , Datasmart 2023		
LCIA Methodology	TRACI 2.1 [3]		
The sub-category PCR review was conducted by:	Jack Geibig, Chair Ecoform	Dr. Thomas Gloria Industrial Ecology Consultants	Thaddeus Owen
LCA and EPD Developer This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting LTD 1701 Market Street Chattanooga, TN 37408 https://wapsustainability.com/ WAP 		
This declaration was independently verified in accordance with ISO 14025:2006[4] . The UL Environment "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report," v3.2 (September 2018), based on ISO 21930:2017 and CEN Norm EN 15804 (2012) , serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017) . ☐ INTERNAL ☒ EXTERNAL			
Independent Verifier This life cycle assessment was independently verified in accordance with ISO 14044 [6] and the reference PCR by:	Tim Brooke 100 Barr Harbor Drive PO Box C700 West Conshohocken, PA, 19428-2959 USA www.astm.org		
LCA and EPD Manufacturer Participants			
		Log and Timber Homes Council	

About the National Association of Home Builders

NAHB collaborates with industry partners to quantify and report the environmental impact of building materials and products. For example, in the LCA report you shared, NAHB commissioned the Athena Sustainable Materials Institute to conduct a cradle-to-gate LCA of log home and timber frame products. The study was aligned with the association's goal of promoting sustainable building practices and creating transparency in environmental impacts across the construction sector. Through such initiatives, the NAHB supports efforts toward more sustainable construction practices by providing detailed data on environmental performance to industry stakeholders, including architects, policymakers, and manufacturers. This EPD initiative helps builders meet criteria for sustainable building

certifications like LEED and Green Globes, advancing environmentally friendly construction practices in North America. Detailed information about NAHB can be found at <https://www.nahb.org/>

2. PRODUCT DESCRIPTION

Milled Log Wall Products (MLW)

Milled Log Wall (MLW) products are precision-crafted construction components made from logs that are machine-processed to ensure uniform dimensions and smooth surfaces for efficient installation. These logs offer exceptional structural integrity while maintaining the aesthetic appeal of natural wood, making them ideal for eco-friendly buildings that blend with their natural surroundings. Additionally, MLW products provide excellent natural insulation, enhancing energy efficiency by reducing heat transfer, and lower energy consumption.

MLW Product Variations

MLW products are available in different variations to meet a variety of construction needs. Key variations include:

- **Log Diameter:** Logs are available in a range of diameters, offering flexibility for different structural applications.
- **Species:** Manufactured from both softwoods (e.g., pine, spruce) and hardwoods (e.g., oak, maple) to provide the desired strength and appearance.
- **Surface Finish:** Options include smooth-planed, tongue-and-groove, or bevelled edges for aesthetic or functional preferences.
- **Joinery Options:** Includes precision-cut profiles for tight-fitting connections, such as saddle notches, dovetail corners or tongue-and-groove joints, ensuring stability and durability.

Source of Timber and Sustainability

MLW products are crafted from timber sourced from sustainably managed forests in North America. The manufacturing process follows sustainable forestry practices to minimize environmental impact. Key aspects include:

- **Sustainable Growth:** Timber harvesting aligns with sustainable forestry practices, ensuring that forest growth exceeds the rate of harvest.
- **Selective Harvesting:** Selective logging techniques maintain forest health and biodiversity, preventing clear-cutting.
- **Common Species:** Pine, spruce, fir, oak, cypress and cedar are among the typical species used, valued for their strength, durability, and suitability for log wall applications.

3. METHODOLOGY

The underlying LCA investigates the lifecycle stages of Milled log wall products production in the United States and Canada from cradle-to-gate.

System Boundaries and Product Flow Diagram

The scope for Milled Log Wall (MLW) products follows a cradle-to-gate system boundary, covering environmental impacts from raw material extraction to the finished product ready for shipment. It consists of three modules: A1 – Raw Material Production, which includes log harvesting, reforestation, thinning, nursery operations, fertilization, and preparation of secondary materials; A2 – Raw Material Transportation, which details the movement of logs and other inputs to manufacturing sites via trucks, rail, or ships; and A3 – Manufacturing, where logs are milled to precise dimensions, shaped into profiles such as tongue-and-groove, and finished according to design specifications. The products are then packaged for delivery.

The manufacturing process consumes electricity, propane, and wood fuels, along with consumables like motor oil and hydraulic fluids. It also generates co-products such as wood chips and sawdust, which are reused as bioenergy or sold to other industries. This cradle-to-gate approach ensures a comprehensive and transparent assessment of the environmental impacts associated with MLW products, promoting sustainable building practices and environmentally conscious decision-making.

Building Life Cycle Information Modules																
Production stage			Construction Stage		Use stage							End-of-life stage				Substitution Effects
Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-Construction/ Demolition	Transport to waste	Waste processing	Disposal	Benefits Outside System
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Figure 2: Life Cycle Stages and Information Modules per ISO 21930:2017

Construction and Service Life Assumptions

The construction and service life assumption aligns with typical building industry standards. While the report emphasizes the cradle-to-gate scope, meaning that the product's full lifecycle (including end-of-life) is not assessed here, the data suggests that SRT products have a long service life, contributing to their sustainability performance.

Declared Unit

The declared unit for the MLW product is defined as one cubic meter (1 m³) of milled log wall. This unit provides a consistent basis for measuring the product's environmental impacts across different stages of production. The MLW product system primarily consists of wood with a density of 439.8 dry kg/m³.

Data Sources

The data sources for this study include both primary data collected directly from eight manufacturing facilities across North America and secondary data from publicly available databases such as DATASMART 2023 and Ecoinvent 3.9. Primary data reflects facility-specific information on energy use, material inputs, and manufacturing processes for the 2021 production year. Secondary data covers aspects such as transportation and raw material extraction.

Treatment of Biogenic Carbon

The report follows the guidelines of UL PCR Part B and ISO 21930 to account for biogenic carbon. North American forests are assumed to have a neutral forest carbon stock, meaning that the biogenic CO₂ emitted during biomass combustion (e.g., for kiln-drying) does not contribute to the overall global warming potential. Although the cradle-to-gate scope of this study does not cover end-of-life emissions, the biogenic carbon stored in the product is quantified as 806.31 kg CO₂ equivalent per m³ (assuming 50% carbon content). This ensures that the carbon sequestration within the wood product is transparently reported and can be used in future cradle-to-grave

assessments Biogenic carbon emissions and removals are reported in accordance with ISO 21930 7.2.7. and 7.2.12. Detailed information is provided in Section 4 of the underlying LCA.

4. LCA Results

The Life Cycle Assessment (LCA) results for MLW products provide a comprehensive environmental profile from cradle-to-gate. The impact categories and characterization factors are derived from the U.S. EPA TRACI 2.1 methodology. The LCA modeling was performed using SimaPro v9.1, which compiled the life cycle inventory (LCI) data and calculated the life cycle impact assessment (LCIA) results.

The contribution analysis shows that manufacturing (A3) is the most impactful phase, contributing approximately 45.8% to the Global Warming Potential (GWP), followed by raw material production (A1) at 37.8% and transportation (A2) at 16.4%. The efficient use of co-products like wood chips and sawdust for bioenergy demonstrates the alignment of MLW production with sustainable practices. These LCA results offer a transparent understanding of the environmental performance of MLW products, promoting their use in eco-friendly construction and supporting the integration of carbon-storing building materials.

Table 1: LCIA Results Summary for Cradle-to-Gate production of 1 m³ of MLW-absolute basis

Core Mandatory Impact Indicator	Unit	Total	A1	A2	A3
Global warming potential – w/biogenic CO ₂	kg CO ₂ e	1.43E+02	-8.15E+02	2.34E+01	9.35E+02
Global warming potential – TRACI 2.1	kg CO ₂ e	1.43E+02	5.39E+01	2.34E+01	6.57E+01
Acidification potential of soil and water sources	kg SO ₂ e	8.45E-01	4.40E-01	1.29E-01	2.76E-01
Eutrophication potential	kg Ne	2.27E-01	5.55E-02	1.03E-02	1.61E-01
Depletion potential of the stratospheric ozone layer	kg CFC11e	3.14E-05	3.05E-05	5.02E-08	8.13E-07
Formation potential of tropospheric ozone	kg O ₃ e	1.72E+01	7.18E+00	3.70E+00	6.32E+00
Abiotic depletion potential (ADP fossil) for fossil resources	MJ, NCV	1.98E+03	7.94E+02	2.90E+02	8.99E+02
Use of Primary Resources					
Renewable primary energy carrier used as energy	MJ, NCV	9.78E+01	3.91E+01	5.43E-01	5.82E+01
Renewable primary energy carrier used as material	MJ, NCV	1.10E+04	1.10E+04	0.00E+00	0.00E+00
Non-renewable primary energy carrier used as energy	MJ, NCV	2.31E+03	8.26E+02	2.94E+02	1.19E+03
Non-renewable primary energy carrier used as material	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary Material, Secondary Fuel, and Recovered Energy					
Secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuel	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuel	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mandatory Inventory Parameters					
Consumption of freshwater resources	m ³	4.51E+00	3.65E-01	3.86E+00	2.80E-01
Indicators Describing Waste					
Hazardous waste disposed	kg	3.86E-01	3.58E-01	5.27E-04	2.74E-02
Non-hazardous waste disposed	kg	5.68E+01	3.39E+00	4.05E-01	5.30E+01
High-level radioactive waste	m ³	1.67E-07	1.45E-08	2.32E-09	1.51E-07
Intermediate- and low-level radioactive waste	m ³	1.41E-06	6.75E-08	1.12E-08	1.33E-06
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported from the product system	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Additional Inventory Parameters					

Biogenic Carbon Removal from Product	kg CO ₂	-1.09E+03	-1.09E+03	0.00E+00	0.00E+00
Biogenic Carbon Emission from Product	kg CO ₂	8.27E+02	0.00E+00	0.00E+00	8.27E+02
Biogenic Carbon Removal from Packaging	kg CO ₂	-5.36E-01	-5.36E-01	0.00E+00	0.00E+00

5. LIMITATIONS

Comparability

This study does not include comparative assertions, making it difficult to benchmark MLW products against other building materials. Differences in system boundaries, allocation methods, and data sources would need to be harmonized to enable meaningful comparisons, limiting the use of the results for competitive product evaluations or market-based comparisons.

Forest Management

The study assumes that North American forests are carbon neutral, meaning there is no net carbon loss due to sustainable forestry practices. However, this assumption may not fully account for regional variations in forest management, changes in land use, or unforeseen environmental events. These factors could affect the actual carbon balance and introduce uncertainty regarding the long-term sustainability of biogenic carbon sequestration.

While this EPD does not address landscape level forest management impacts, potential impacts may be addressed through requirements put forth in regional regulatory frameworks, ASTM 7612-15 guidance, and ISO 21930 Section 7.2.11 including notes therein. These documents, combined with this EPD, may provide a more complete picture of the environmental and social performance of wood products.

EPD Scope

The cradle-to-gate scope limits the EPD by excluding the product's use phase, maintenance, and end-of-life stages. This restricts the report's ability to offer insights into the total environmental performance of HLW products in real-world applications.

Accuracy of Results

The accuracy of the results may be affected by the limited sample size, as only eight manufacturing facilities were included. Additionally, the reliance on secondary data for aspects such as transportation and raw material extraction introduces variability. While primary data collection reflects actual production practices, averaging across facilities could mask specific differences, reducing the precision of the environmental impact assessments for individual production sites.

6. REFERENCES

1. Abergel, T.; Dean, B.; Dulac, J. 2017. Towards a zeroemission, efficient, and resilient buildings and construction sector: Global Status Report 2017. Paris, France: UN Environment, International Energy Agency.
2. ULE. 2018. Part A: life cycle assessment calculation rules and report requirements. Washington, DC: UL Environment. 47 p.
3. ULE. 2019. Guidance for building-related products and services: Part b: Structural and architectural wood products EPD requirements. Washington, DC: UL Environment. 31 p.
4. ISO. 2006c. ISO 14044. Environmental management: life cycle assessments: requirements and guidelines. Geneva, Switzerland: International Standardization Organization. 54 p.
5. ISO. 2006b. ISO 14040. Environmental management: life cycle assessment; principles and framework. Geneva, Switzerland: International Organization for Standardization. 28 p.
6. PRé Consultants. 2020. SimaPro 9.5 life-cycle assessment software package, version 9.0. Amersfoort, the Netherlands: PRé Consultants.
7. LTS. 2023. DATASmart LCI package (US-EI SimaPro®Library). Huntington, VT: Long Trail Sustainability. <https://ltsexperts.com/services/software/datasmart-lifecycle-inventory/>.

8. Bare, J. 2011. TRACI 2.0: the tool for the reduction and assessment of chemical and other environmental impacts 2.0. *Clean Technologies and Environmental Policy*. 13(5): 687-696.
9. ISO. 2017. ISO 21930. Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services. Geneva, Switzerland: International Standardization Organization. 90 p.