Environmental Product Declaration

Log and Timber Homes Council

A Cradle-to-Gate EPD of Handcrafted log wall products (HLW)

According to
ISO 21930
ISO 14025
ISO 14040/44

Summary Results –per m³ ***Full Results in Table 1***		**Cradle-to-Gate Total**
Global warming potential	kg CO_2e	5.83E+01
Acidification potential of soil and water sources	kg SO_2e	5.07E-01
Eutrophication potential	kg Ne	1.00E-01
Depletion potential of the stratospheric ozone layer	kg CFC11e	3.75E-07
Formation potential of tropospheric ozone	kg O_3e	1.47E+01
Abiotic depletion potential (ADP fossil) for fossil resources	MJ, NCV	7.96E+02

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
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
Declaration Number	EPD 997
Declared Product	Handcrafted log wall products (HLW)
Declared Unit	1 m³ of HLW 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	25.09.2025

Period of Validity	24.09.2030		
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 [9], Ecoinvent 3.9 [15], Datasmart 2023[8]		
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:	**Athena Sustainable Materials Institute** 100 Broadview Avenue, Suite 909 Ottawa, ON K1S 5P6 https://www.athenasmi.org/ Athena		
This declaration was independently verified in accordance with **ISO 14025:2006[4]**. Environmental declarations from different programs (ISO 14025) may not be comparable. 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 x 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			
NAHB National Association of Home Builders — Log and Timber Homes Council			

About the National Wood Flooring Association

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

Handcrafted Log Wall Products (HLW)

Handcrafted log wall products are construction materials made from whole logs, shaped and fitted to build walls that offer natural insulation, durability, and aesthetic appeal. These logs are harvested directly from forests and carefully debarked and shaped by skilled craftsmen to retain their natural form while ensuring structural integrity.

HLW Product Variations

Full conformance with the PCR for wood products allows EPD comparability only when all life cycle stages (A1 to C4 and beyond, if applicable) have been considered, when EPDs comply with all referenced standards, utilize the same sub-category Part B PCR, and apply equivalent scenarios related to the construction works. It is important to note that variations and deviations may still occur.

The variations in handcrafted log wall products come from the type of wood used, the dimensions of the logs, and the specific craftsmanship techniques. Variations include:

- **Log Diameter**: Small-diameter to large-diameter logs.
- **Species**: Softwood (e.g., pine, spruce) or hardwood.
- **Finish**: Natural, stained, or sealed.
- **Joinery Methods**: Saddle notches, dovetail notches, or chinking. Handcrafted logs can be customized based on the project requirements, allowing for smooth or hand-hewn finishes.

North American Forests

The handcrafted log wall products covered in this study primarily use logs sourced from sustainably managed forests in North America. Timber is selected to ensure minimal environmental impact and compliance with sustainable forestry practices.

Research demonstrates that log production aligns with sustainable forestry management. Some key highlights include:

- North American forests grow more timber than is harvested annually, contributing to forest regeneration.
- Sustainable forestry practices, such as selective harvesting, help maintain forest health and prevent clear-cutting.
- Timber used in handcrafted log wall products comes from species such as pine, spruce, fir, cedar, and oak, which are known for their strength and durability.
- Craftsmanship ensures each log is optimally utilized, reducing waste and enhancing longevity.

Handcrafted log wall products bring both functionality and aesthetic appeal, creating eco-friendly, energy-efficient structures that blend seamlessly with natural surroundings.

3. METHODOLOGY

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

System Boundaries and Product Flow Diagram

The scope for Handcrafted Log Wall (HLW) products adopts a cradle-to-gate system boundary, covering environmental impacts from raw material extraction to the final product ready for shipment. The system boundary consists of three modules: A1 – Raw Material Production, which includes log harvesting, nursery operations, reforestation, thinning, fertilization, and preparation of secondary materials; A2 – Raw Material Transportation, detailing the movement of logs and other inputs to manufacturing facilities using trucks, rail, or ships; and A3 – Manufacturing, which involves milling logs into the required dimensions, applying joinery techniques such as notches for structural stability, and packaging the products for delivery. Energy sources such as electricity, propane, and wood fuels, along with consumables like motor oil, hydraulic fluids, and fasteners, are accounted for in the manufacturing phase. The product flow starts with the extraction of logs, followed by transportation, processing, packaging, and generating co-products like wood chips and shavings, which are either used for energy or sold to other industries. This approach ensures that the EPD provides a detailed and transparent assessment of the environmental impacts of HLW products, supporting 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/	Transport to waste processing or disposal	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 HLW products have a long service life, contributing to their sustainability performance.

Declared Unit

The functional unit for the HLW product is defined as one cubic meter (1 m^3) of handcrafted log wall. This unit provides a basis for measuring the product's environmental impacts consistently across different production stages. The HLW product system mainly consists of wood with a density of 439.8 dry kg/m^3.

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 CO_2 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 CO_2 equivalent per m^3 (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 assessmentsBiogenic 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.

Allocation Procedures:

Allocation procedures are conducted in accordance with ISO 14044 and ISO 21930. When processes produce multiple co-products, inputs and outputs are allocated to the products based on physical relationships (such as mass or energy content) or economic value, depending on data availability and relevance. When neither physical nor economic allocation is possible, system expansion is applied to avoid allocation. Specific allocation details for coproducts are provided within the life cycle inventory documentation.

Cut-off Criteria:

The cut-off criteria applied in this study exclude flows that collectively contribute less than 1% of the total mass, energy, or environmental significance of the product system. All significant inputs and outputs are included. No known flows are deliberately excluded from this EPD.

Health, Safety and Environmental Aspects

This product does not contain hazardous, dangerous, or regulated substances that are known to adversely affect human health or the environment. The product is free from substances that are restricted or subject to specific regulations under applicable health, safety, and environmental legislation. This declaration is made in accordance with ISO 21930:2017 standards for sustainability in building construction.

4. LCA Results

The Life Cycle Assessment (LCA) results for Handcrafted Log Wall (HLW) products provide a comprehensive environmental profile of the product from cradle-to-gate. The impact categories and characterization factors (CF) are from the U.S. EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts -TRACI 2.1 [6]. SimaPro v9.1 [10] was used to accumulate the LCI data and to calculate the LCIA results.

The contribution analysis shows that manufacturing (A3) is the most impactful phase, contributing about 60.2% to the GWP, followed by raw material supply (A1) at 36.6% and transportation (A2) at 3.2%. The reliance on renewable energy sources and the efficient use of co-products, such as wood chips, demonstrate the product's alignment with sustainable practices. These LCA results offer a clear and transparent understanding of the environmental footprint of HLW products, supporting their role in sustainable construction and promoting the use of carbon-storing building materials

Table 1: LCIA Results Summary for Cradle-to-Gate production of 1 m^3 of HLW-absolute basis

Core Mandatory Impact Indicator	Unit	Total	A1	A2	A3
Global warming potential – w/biogenic CO_2	kg CO_2e	6.18E+01	-1.06E+03	1.85E+00	1.12E+03
Global warming potential – TRACI 2.1	kg CO_2e	5.83E+01	2.12E+01	1.85E+00	3.52E+01
Acidification potential of soil and water sources	kg SO_2e	5.07E-01	2.07E-01	1.01E-02	2.90E-01
Eutrophication potential	kg Ne	1.00E-01	3.19E-02	8.12E-04	6.76E-02
Depletion potential of the stratospheric ozone layer	kg CFC11e	3.75E-07	1.36E-09	3.22E-09	3.70E-07
Formation potential of tropospheric ozone	kg O_3e	1.47E+01	5.74E+00	2.92E-01	8.62E+00
Abiotic depletion potential (ADPfossil) for fossil	MJ, NCV	7.96E+02	2.90E+02	2.29E+01	4.83E+02

resources					
Use of Primary Resources					
Renewable primary energy carrier used as energy	MJ, NCV	1.97E+01	0.00E+00	4.21E-02	1.96E+01
Renewable primary energy carrier used as material	MJ, NCV	1.07E+04	1.07E+04	0.00E+00	0.00E+00
Non-renewable primary energy carrier used as energy	MJ, NCV	8.97E+02	2.90E+02	2.33E+01	5.83E+02
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	4.28E-01	3.94E-02	3.02E-01	8.63E-02
Indicators Describing Waste					
Hazardous waste disposed	kg	8.80E-03	0.00E+00	2.74E-05	8.78E-03
Non-hazardous waste disposed	kg	1.57E+00	3.10E-01	3.21E-02	1.23E+00
High-level radioactive waste	m^3	5.21E-08	0.00E+00	1.82E-10	5.19E-08
Intermediate- and low-level radioactive waste	m^3	4.53E-07	0.00E+00	8.75E-10	4.52E-07
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	-1.06E+03	-1.06E+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	-4.56E-02	-4.56E-02	0.00E+00	0.00E+00
Biogenic Carbon Emission from Packaging	kg CO_2	4.56E-02	0.00E+00	0.00E+00	4.56E-02

5. LIMITATIONS

Comparability

The study does not include comparative assertions, making it difficult to benchmark HLW products against other building materials. Differences in system boundaries, allocation methods, and data sources would need to be aligned for meaningful comparisons, limiting the use of the results for competitive product evaluations or market-based comparisons. Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of wood products using EPD information shall be based on the product's use and impacts at the construction works level, and therefore EPDs may not be used for comparability purposes when not considering the construction works energy use phase as instructed under this PCR".

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

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