Environmental Product Declaration

National Association of Home Builders

Log and Timber Homes Council

A Cradle-to-Gate EPD of Sawn timber framing products (STF)

ASTM INTERNATIONAL

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 – w/biogenic CO_2	kg CO_2e	1.34E+02
Global warming potential – TRACI 2.1	kg CO_2e	1.34E+02
Acidification potential of soil and water sources	kg SO_2e	2.19E-01
Eutrophication potential	kg Ne	2.30E-02
Depletion potential of the stratospheric ozone layer	kg CFC11e	1.12E-09
Formation potential of tropospheric ozone	kg O_3e	4.59E+00

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 xxx
Declared Product	Sawn timber framing products (STF)
Declared Unit	1 m^3 of STF 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 [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:	**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 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 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

Sawn Timber Framing Products (STF)

Sawn Timber Framing (STF) products are precision-cut wood components used in structural applications for residential, commercial, and industrial buildings. These timber products offer excellent load-bearing capacity and much more economically friendly than any laminated products in the market. Also, timber products are far better than laminated products in terms of carbon footprint which improves the environmental performance of the product. STF products are valued for their durability, versatility, ease of use, and ability to seamlessly integrate into various architectural designs.

STF Product Variations

STF products are available in different variations to meet diverse construction needs. Key variations include:

- Dimensions: Available in a range of standardized and custom sizes to fit various structural applications.
- Species: Manufactured from both softwoods (e.g., pine, spruce) and hardwoods (e.g., oak, maple) to provide the desired strength and performance.
- Surface Finish: Offered in smooth, planed, or rough-sawn finishes to suit aesthetic or functional requirements.
- Joinery Options: Customizable for tight-fitting joints, including mortise-and-tenon or lap joints, to enhance structural stability.

Source of Timber and Sustainability

STF products are made from timber sourced from sustainably managed forests in North America. Production practices align with sustainable forestry management to ensure minimal environmental impact. Key aspects include:

- Sustainable Growth: Timber harvesting follows sustainable forestry practices, ensuring that forest growth outpaces harvesting rates.
- Selective Harvesting: Practices like selective logging help maintain forest health and biodiversity while preventing clear-cutting.
- Common Species: STF products commonly use species like pine, fir, spruce, and oak, valued for their strength, durability, and suitability for framing.

3. METHODOLOGY

The underlying LCA investigates the lifecycle stages of Sawn Round Timber Framing Products production in the United States and Canada from cradle-to-gate.

System Boundaries and Product Flow Diagram

The scope for Sawn Timber Framing (STF) products follows a cradle-to-gate system boundary, encompassing environmental impacts from raw material extraction to the finished product ready for shipment. It includes three modules: A1 – Raw Material Production, covering log harvesting, nursery operations, reforestation, thinning, fertilization, and preparation of secondary materials; A2 – Raw Material Transportation, which details the movement of logs and inputs to manufacturing facilities via trucks, rail, or ships; and A3 – Manufacturing, which involves sawing logs to precise dimensions, applying finishes such as planning or rough-sawing, and packaging the products for delivery. The manufacturing process consumes energy in the form of electricity, propane, and wood fuels, along with consumables such as motor oil, hydraulic fluids, and fasteners. It also generates co-products like sawdust and wood chips, which are reused for bioenergy or sold to other industries. This cradle-to-gate system ensures a detailed and transparent assessment of the environmental impacts associated with STF products, promoting sustainable construction 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 SRT product is defined as one cubic meter (1 m^3) of sawn timber framing. This unit provides a consistent basis for measuring the product's environmental impact across different stages of production. The STF product system primarily 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.

4. LCA Results

The Life Cycle Assessment (LCA) results for STF products provide a detailed environmental profile from cradle-to-gate. The impact categories and characterization factors are based on the U.S. EPA's TRACI 2.1 methodology. The LCA modelling used SimaPro v9.1 to gather life cycle inventory (LCI) data and calculate the life cycle impact assessment (LCIA) results.

The contribution analysis shows that manufacturing (A3) is the most significant phase, contributing 58.4% to the Global Warming Potential (GWP), followed by transportation (A2) at 23.5%, and raw material production (A1) at 18.0%. The reliance on renewable energy sources and the efficient management of co-products, such as wood chips, align STF products with sustainable production practices. These results provide a transparent understanding of the environmental impact of STF products, promoting their use in sustainable construction and encouraging the adoption of carbon-storing materials in the building sector.

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

Core Mandatory Impact Indicator	Unit	Total	A1	A2	A3
Global warming potential – w/biogenic CO_2	kg CO_2e	1.34E+02	-7.14E+02	3.15E+01	8.17E+02
Global warming potential – TRACI 2.1	kg CO_2e	1.34E+02	2.41E+01	3.15E+01	7.89E+01
Acidification potential of soil and water sources	kg SO_2e	2.19E-01	2.13E-01	2.80E-01	2.19E-01
Eutrophication potential	kg Ne	2.30E-02	1.96E-02	2.17E-01	2.30E-02
Depletion potential of the stratospheric ozone layer	kg CFC11e	1.12E-09	1.32E-06	6.84E-07	1.12E-09
Formation potential of tropospheric ozone	kg O_3e	4.59E+00	6.26E+00	6.07E+00	4.59E+00
Abiotic depletion potential (ADPfossil) for fossil resources	MJ, NCV	3.26E+02	3.97E+02	1.07E+03	3.26E+02
Use of Primary Resources					
Renewable primary energy carrier used as energy	MJ, NCV	7.50E+01	0.00E+00	1.88E+00	7.31E+01
Renewable primary energy carrier used as material	MJ, NCV	8.15E+03	8.15E+03	0.00E+00	0.00E+00
Non-renewable primary energy carrier used as energy	MJ, NCV	2.18E+03	3.26E+02	4.06E+02	1.45E+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	1.29E+01	2.69E-02	1.24E+01	4.08E-01
Indicators Describing Waste					
Hazardous waste disposed	kg	7.03E-02	0.00E+00	3.64E-02	3.39E-02
Non-hazardous waste disposed	kg	1.46E+02	1.44E+00	1.13E+00	1.44E+02
High-level radioactive waste	m^3	1.94E-07	0.00E+00	4.99E-09	1.89E-07
Intermediate- and low-level radioactive waste	m^3	1.71E-06	0.00E+00	2.39E-08	1.68E-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	-9.96E+02	-9.96E+02	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	-6.80E-01	-6.80E-01	0.00E+00	0.00E+00

5. LIMITATIONS

Comparability

This study does not include comparative assertions, making it challenging to benchmark STF products against other building materials. To enable meaningful comparisons, system boundaries, allocation methods, and data sources would need to be harmonized, limiting the application of these results for competitive 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

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