Environmental Product Declaration

Nordic X-Lam™

Product Description

Type III environmental product declaration for cross-laminated timber manufactured at Nordic Structures developed according to PCR for North American Structural and Architectural Wood Products (FPInnovations, November 2011).

Issued March, 2013
Valid until March, 2018

NORDIC STRUCTURES

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Manufacturer Information

This EPD represents cross-laminated timber produced at Nordic Structures located in Chibougamau, Quebec, Canada. This EPD is based on a life cycle assessment study compiled in 2012 with input and environmental output data gathered for the 2011 calendar year.

Product Description

"Nordic X-Lam™" is a structural panel product (cross-laminated timber) composed of cross-wise glued-laminated wood (black spruce) boards. Cross-laminated timber (CLT) is used for wall, floor/ceiling and roof applications in commercial, multi-residential and residential buildings.

Product composition on the basis of 1m^3 of CLT output at the mill gate:

- Wood portion: 1m^3 (417 kg on oven dry basis)
- Resin: 4.94 kg (Polyurethane and isocyanate)
- Lumber wrap: 0,46 kg (HDPE)

Scope: Cradle-to-gate.

Declared unit: 1m^3 of CLT at mill gate.

System boundary: Life cycle activities from resource extraction through product (CLT) manufacture.

Geographic coverage: North America.

Life Cycle Assessment

Life cycle assessment (LCA) is a rigorous study of inputs and outputs over the life of a product or process and the associated environmental impact of those flows to and from nature. The underlying LCA supporting this EPD relied on two LCA data sources: primary data gathered from Nordic Structures's engineered wood product manufacturing facility located in Chibougamau, Quebec and secondary data available in a cradle-to-gate softwood lumber report[1].

The system boundary includes all the production steps from extraction of raw materials from the earth (the cradle) through to final CLT product at the mill gate (the gate). See Figure 1. The boundary includes the transportation of major inputs to, and within, each activity stage.

Ancillary materials such as hydraulic fluids, lubricants and packaging are included in the boundary. Mass or energy flows are excluded if they account for less than 1% of model flows and less than 2% of life cycle impacts in all categories. Human activity and capital equipment are excluded.

[1]Athena Institute (2009) A Cradle-to-Gate Life CycleAssessmentofCanadianSoftwoodLumber: http://www.athenasmi.org

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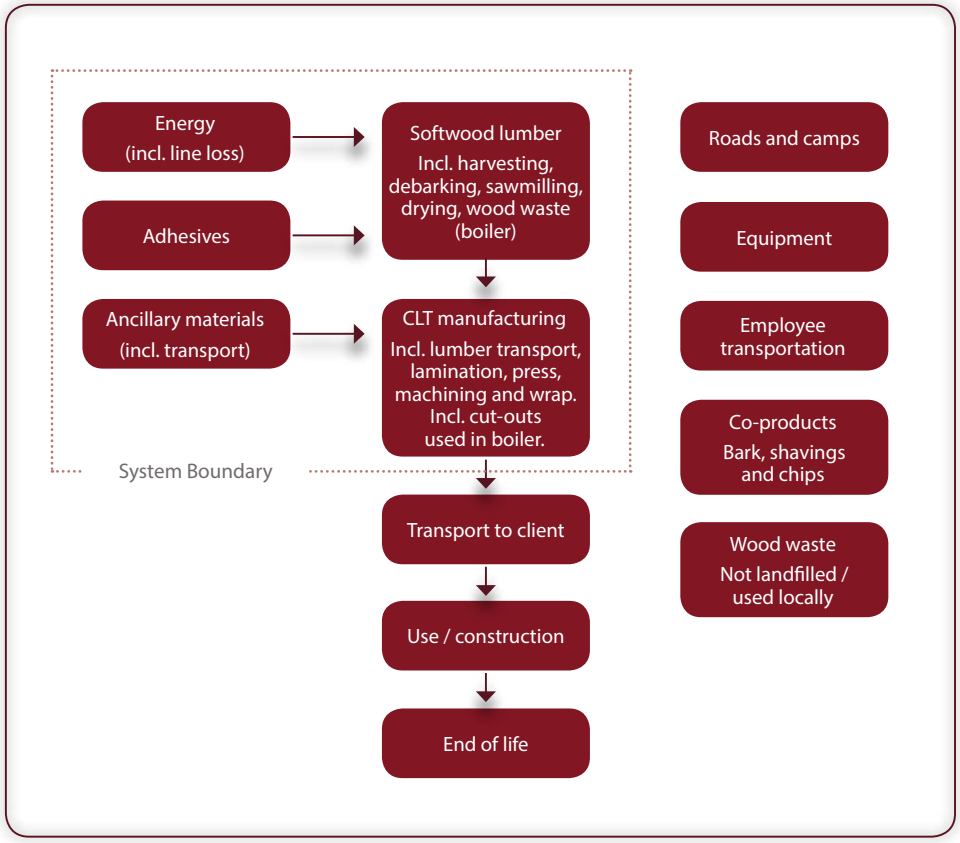

Figure 1: System Boundary and Process Flows

Environmental Performance

The U.S. Environmental Protection Agency's TRACI (Tool for the Reduction and Assessment of Chemical and other Environmental Impacts) life cycle impact assessment methodology is applied to calculate environmental performance of CLT. Per declared unit energy and material resource consumption, waste and impact indicator results are presented in Table 1, 2, 3, 4 and 5, and Figure 2. Impact indicators used are global warming potential (GWP), acidification potential, eutrophication potential, smog potential, and ozone depletion potential. The LCA model is designed to track all carbon fluxes in the GWP measure: the carbon stored in CLT and all carbon emissions, including those from biomass combustion throughout the cradle-to-gate life cycle. CLT's carbon content is presented in Table 6 on page 6. The product contains no hazardous waste.

CLT is manufactured from lumber, which is a product that results from a system generating multiple products that provide revenue: the main product (lumber) and co-products (sawdust, planar shavings, pulp chips, etc.). The PCR requires mass-based allocation for multi-product systems where there is no more than ten times difference in the economic value across co-products; this is the case with the lumber used in CLT. As for CLT itself, this is a single-product process resulting in a main product with value (CLT) and wood waste with no value. Therefore, the environmental burden of CLT manufacturing is entirely allocated to CLT.

Table 1: Environmental performance of CLT, by life cycle stage

	Unit	Total	Logging	Lumber milling	CLT Manufacturing
Total Energy	MJ eq	3327.64	180.15	1771.81	1375.67
Non-renewable, fossil	MJ eq	1208.29	177.94	454.49	575.85
Non-renewable, nuclear	MJ eq	140.19	1.84	68.79	69.56
Renewable, biomass	MJ eq	1381.02	0.00	1165.14	215.88
Renewable, other	MJ eq	598.14	0.37	83.40	514.37
Global warming potential (GWP)	kg CO_2 eq	70.52	12.00	28.59	29.93
Acidification potential	H^+ moles eq	39.79	1.26	26.45	12.08
Eutrophication potential	kg N eq	1.09E-01	1.64E-03	9.17E-02	1.55E-02
Smog potential	kg O_3 eq	15.26	0.55	11.83	2.87
Ozone depletion potential	kg CFC-11 eq	3.94E-07	5.92E-10	7.53E-10	3.93E-07

Note: GWP does not include biogenic carbon sinks and sources.
Renewable, other consists mostly of hydro power

Table 2: Proportional Primary Energy Consumption by Life Cycle Stage

Impact category	Logging	Lumber milling	CLT Manufacturing
Primary energy	5%	53%	41%

Figure 2: Total primary energy consumption, by source

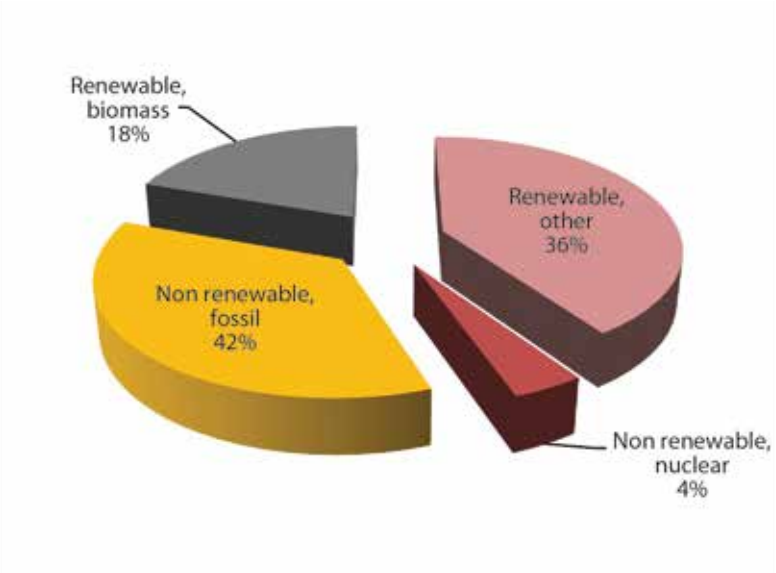

Table 3: Contributions by life cycle stage

Impact Category	Unit	Total	Logging	Lumber Milling	CLT manufacturing
Fossil energy use	MJ	1208.29	15%	38%	48%
Global warming potential (GWP)	kg CO_2 eq	70.52	17%	41%	42%
Acidification potential	H^+moles eq	39.79	3%	66%	30%
Eutrophication potential	kg N eq	1.09E-01	2%	84%	14%
Smog potential	kg O_3 eq	15.26	4%	78%	19%
Ozone depletion potential	kg CFC-11eq	3.94E-07	0%	0%	100%

Note: GWP does not include biomass combustion CO_2

Table 4: Renewable and non-renewable material consumption and waste

Impact Category		Unit	Total	Logging and lumber milling	CLT manufacturing
Wood Fiber (oven dry basis)		kg	542.19	542.19	0.00
Non- renewable material consumption		kg	39.49	18.23	21.26
Freshwater	withdrawal	1	474.32	35.61	438.71
	consumption	1	164.13	24.36	139.77
Total waste:		kg	130.13	57.43	73.00
Hazardous		kg	0.00	0.00	0.00
Non-hazardous (wood waste and other solid waste)		kg	130.13	57.43	73.00

Table 5: CLT manufacturing contributions (gate-to-gate)

Impact category	Units	Total	Resins	Energy	Transport	Packaging
Global warming potential	kg CO_2 eq	29.93	61%	13%	24%	2%
Acidification potential	H+moles eq	12.08	65%	12%	17%	6%
Eutrophication potential	kg N eq	1.55E-02	74%	10%	15%	1%
Smog potential	kg O_3 eq	2.87	32%	26%	40%	1%
Ozone depletion potential	kg CFC-11 eq	3.93E-07	100%	0%	0%	0%
Total Energy	MJ eq	1375.67	30%	60%	7%	3%
Non renewable, fossil	MJ eq	575.85	67%	10%	17%	7%
Non-renewable, nuclear	MJ eq	69.56	43%	55%	1%	1%
Renewable, biomass	MJ eq	215.88	0%	100%	0%	0%
Renewable, other	MJ eq	514.37	0%	100%	0%	0%

Renewable, other consists mostly hydro powe

Additional Environmental Information

Sustainable Forestry

Nordic Structures is committed to sustainable forestry; Nordic Structures strictly applies government rules and regulations pertaining to forestry in order to ensure that forestry operations are carried out in a sustainable manner. In addition, the cutting strategy of Nordic Structures is based on development plans aimed at minimizing the impact of forestry operations on soils from felling and skidding that, in turn, encourage native regeneration. Overall, these management practices aim to ensure the new stand stocking is at least 10% greater than the former stocking.

According to ASTM D7612, the company's wood fiber sources fall into the following two categories:

- Certified sources 40% of Nordic's wood fiber comes from FSC certified forests
- Responsible sources 60% of wood fiber comes from sustainably managed forests where proprietary forestry standards and government regulations apply.

Carbon content

Carbon is part of the molecular composition of wood. This carbon, which is removed from the atmosphere as trees grow, is a consideration in greenhouse gas calculations and carbon footprints for wood products. The carbon content of 1 m^3 of CLT (cradle-to-gate) is presented in Table 6.

Table 6: Carbon content1 m^3 of CLT

Forest carbon uptake	-764.56 (kg CO_2 eq.)

Glossary

Primary Energy Consumption
Primary energy is the total energy consumed by a process including energy production and delivery losses. Energy is reported in megajoules (MJ).

Global Warming Potential
This impact category refers to the potential change in the earth's climate due to accumulation of greenhouse gases and subsequent trapping of heat from reflected sunlight that would otherwise have passed out of the earth's atmosphere. Greenhouse gas refers to several different gases including carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). For global warming potential, these gas emissions are tracked and their potencies reported in terms of kg of CO_2 equivalent.

Ozone Depletion Potential
This impact category addresses the reduction of protective ozone within the atmosphere caused by emissions of ozone-depleting substances such as chlorofluorocarbons (CFCs). Reduction in ozone in the stratosphere leads to increased ultraviolet-B radiation reaching Earth, which can have human health impacts as well as damage crops, materials and marine life. Ozone depletion potential is reported in terms of kg of CFC-11 equivalent.

Acidification Potential
Acidification refers to processes that increase the acidity of water and soil systems as measured by hydrogen ion concentrations (H^+) and are often manifested as acid rain. Damage to ecosystems can result, as well as corrosive effects on buildings, monuments and historical artifacts. Atmospheric emissions of nitrogen oxides (NO_x) and sulphur dioxide (SO_2) are the main agents affecting these processes. Acidification potential is reported in terms of moles of H^+ equivalent.

Eutrophication Potential
Eutrophication is the fertilization of surface waters by nutrients that were previously scarce, leading to a proliferation of aquatic photosynthetic plant life which may then lead to further consequences including foul odor or taste, loss of aquatic life, or production of toxins. Eutrophication is caused by excessive emissions to water of phosphorus (P) and nitrogen (N). This impact category is reported in terms of kg of N equivalent.

Smog Potential
Photochemical smog is the chemical reaction of sunlight, nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in the atmosphere. Ground-level ozone is an indicator, and NO_x emissions are a key driver in the creation of ground-level ozone. This impact indicator is reported in terms of kg of O_3 equivalent.

Source: Bare et al, 2003

References

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About this EPD

PCR: North American Structural and Architectural Wood Products. November 2011. Prepared by FPInnovations and available at www.fpinnovations.ca.

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EPDs based on cradle-to-gate information modules using a declared unit shall not be used for comparisons. For additional information on this EPD, please contact Julie Frappier - Director of technical services.
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EPDs from different programs may not be comparable.

This EPD presents average product performance.

EPD is based on a LCA done by FPInnovations / Athena.

EPDs do not address all issues of relevance to sustainability.

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NORDIC STRUCTURES

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Issued March, 2013
Valid until March, 2018