Nordic X-Lam™

This Type III environmental declaration is developed according to ISO 21930 and 14025 for cross-laminated timber (CLT) manufactured at Nordic Structures. This environmental product declaration (EPD) reports environmental impacts based on established life cycle impact assessment (LCA) methods. The reported environmental impacts are estimates, and their level of accuracy may differ for a particular product line and reported impact. LCAs do not generally address site-specific environmental issues related to resource extraction or toxic effects of products on human health. Unreported environmental impacts include (but are not limited to) factors attributable to human health, land use change and habitat destruction. Forest certification systems and government regulations address some of these issues. The products in this EPD conform to: Forest Management Standards of Quebec and forest certification schemes (Forest Stewardship Council (FSC) and Certification of Forest Management Enterprises (CEAF)). EPDs do not report product environmental performance against any benchmark.

Issued August, 2018
Valid until August, 2023
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 2018 with input and environmental output data gathered for the 2017 calendar year.

Product Description

“Nordic X-Lam™” is a structural panel product (cross-laminated timber) composed of cross-wise glued 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 1 m$^3$ of CLT output at the mill gate:

- Wood portion: 1 m$^3$ (406 kg on oven dry basis)
- Resin: 4.46 kg (Polyurethane and isocyanate)
- Lumber wrap: 0.46 kg (HDPE)

Scope: Cradle-to-gate.
Declared unit: 1 m$^3$ 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 lumber and wood product manufacturing facility located in Chibougamau, Quebec and in-house resource extraction data gathered from harvesting operations occurring in Quebec in 2016.

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.

This study followed the information modules defined in the wood products PCR:

- A1 – extraction (removal) of raw materials and processing;
- A2 – transportation of raw materials from an extraction site to a manufacturing site;
- A3 – manufacturing of the wood construction product, including packaging.

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.
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. 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. A summary of the carbon balance at each life cycle stage is depicted in Table 2 on page 4.
Table 1: Environmental performance, 1m³ of Nordic X-Lam™ by life cycle stage – absolute values

<table>
<thead>
<tr>
<th>Impact Category</th>
<th>Unit</th>
<th>Total</th>
<th>Resource Extraction</th>
<th>Resource Transport</th>
<th>Product Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A1</td>
<td>A2</td>
<td>A3</td>
</tr>
<tr>
<td>Global Warming</td>
<td>kg CO₂ eq</td>
<td>121.89</td>
<td>37.88</td>
<td>51.97</td>
<td>32.04</td>
</tr>
<tr>
<td>Ozone depletion</td>
<td>kg CFC-11 eq</td>
<td>1.79E-06</td>
<td>4.20E-07</td>
<td>1.18E-08</td>
<td>1.36E-06</td>
</tr>
<tr>
<td>Acidification</td>
<td>kg SO₂ eq</td>
<td>1.19</td>
<td>0.50</td>
<td>0.31</td>
<td>0.39</td>
</tr>
<tr>
<td>Eutrophication</td>
<td>kg N eq</td>
<td>0.11</td>
<td>0.03</td>
<td>0.02</td>
<td>0.06</td>
</tr>
<tr>
<td>Smog</td>
<td>kg O₃ eq</td>
<td>35.53</td>
<td>15.16</td>
<td>8.31</td>
<td>12.06</td>
</tr>
<tr>
<td>Total Energy</td>
<td>MJ eq</td>
<td>2786.74</td>
<td>582.62</td>
<td>698.11</td>
<td>1506.02</td>
</tr>
<tr>
<td></td>
<td>Fossil MJ eq</td>
<td>1831.88</td>
<td>572.46</td>
<td>696.95</td>
<td>562.47</td>
</tr>
<tr>
<td></td>
<td>Nuclear MJ eq</td>
<td>67.35</td>
<td>0.84</td>
<td>0.29</td>
<td>66.22</td>
</tr>
<tr>
<td></td>
<td>Biomass MJ eq</td>
<td>261.74</td>
<td>0.40</td>
<td>0.08</td>
<td>261.26</td>
</tr>
<tr>
<td></td>
<td>Other renewable* MJ eq</td>
<td>625.78</td>
<td>8.92</td>
<td>0.79</td>
<td>616.08</td>
</tr>
</tbody>
</table>

Material resource consumption
- Non-renewable materials kg | 38.84 | 11.44 | 14.22 | 13.18 |
- Renewable materials (wood) kg | 406.00 | 406.00 |
- Fresh water m³ | 0.26 | 2.23E-03 | 4.00E-04 | 0.26 |

Waste generated
- Hazardous waste kg | 0.00 | 0.00 | 0.00 | 0.00 |
- Non-hazardous waste kg | 1629.05 | 1056.74 | 0.00 | 572.32 |

Feedstock energy MJ** | 8282.40 | 8282.40 |

Note: *Other renewables include solar, wind, geothermal and hydro  **Higher heating value basis
Additional Environmental Information

Sustainable Forestry
Nordic is committed to sustainable forestry and 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 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 category:

- Certified sources of Nordic’s wood fiber comes from FSC certified forests

Carbon Balance
The carbon that is part of the molecular composition of wood. This carbon, which is removed as trees grow, is a consideration in greenhouse gas calculations and carbon footprints for wood products. The carbon content of 1 m³ of CLT (cradle-to-gate) is presented in Table 2.

Table 2: Carbon balance

<table>
<thead>
<tr>
<th>Impact Category</th>
<th>kg of CO₂ eq.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest carbon uptake</td>
<td>-741.36</td>
</tr>
<tr>
<td>Life cycle GHG emissions</td>
<td>121.89</td>
</tr>
<tr>
<td>Unaccounted biogenic carbon emissions in GWP reporting</td>
<td>28.50</td>
</tr>
<tr>
<td>Net GWP</td>
<td>-590.97</td>
</tr>
</tbody>
</table>

Note: *Carbon content in wood 49.8% on oven dry basis (Hunt, et. al., 2010)
### 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\(_2\)O). For global warming potential, these gas emissions are tracked and their potencies reported in terms of equivalent units of CO\(_2\).

**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 units of equivalent CFC-11.

**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 plant and animal 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 SO\(_2\) mole equivalent per kilogram of emission.

**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 units 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 units of NO\(_x\) equivalent.

source: Bare et. al.2003
References


Bare, Jane C. 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(S).


About this EPD


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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
EPD is based on LCA done by FPInnovations
EPDs do not address all issues of relevance to sustainability

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EPD Review:
Independent verification of the declaration and data, according to ISO 14025 (please circle or check):

Internal External √

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