ENVIRONMENTAL PRODUCT DECLARATION

I-JOISTS

ROSEBURG FOREST PRODUCTS COMPANY

Founded in 1936, Roseburg Forest Products is a privately-owned company. Roseburg manufactures stud lumber, softwood and hardwood plywood, engineered wood including I-joists and laminated veneer lumber. Roseburg is one of North America's leading producers of particleboard, medium density fiberboard, and thermally fused laminates. The company owns and sustainably manages more than 600,000 acres of timberland in Oregon, North Carolina and Virginia, as well as an export wood chip terminal facility in Coos Bay, Oregon. Roseburg products are shipped throughout North America and the Pacific Rim.

CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

PROGRAM OPERATOR	UL Environment
DECLARATION HOLDER	Roseburg Forest Products
DECLARATION NUMBER	4786969381.106.1
DECLARED PRODUCT	I-Joist
REFERENCE PCR	FPInnovations: 2015. Product Category Rules (PCR) for preparing an Environmental Declaration for North American Structural and Architectural Wood Products, Version 2 (UN CPC 31, NAICS 321), June 18, 2015.
DATE OF ISSUE	June 6, 2018
PERIOD OF VALIDITY	5 Years
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications
The PCR review was conducted by:	PCR Peer Review Panel Chair: Thomas P. Gloria Industrial Ecology Consultants
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	Grant R. Martin Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas Gloria, Industrial Ecology Consultants

This EPD conforms with ISO 21930:2007 & EN 15804

Foreword

This Type III environmental declaration is developed according to ISO 21930 and 14025 for I-joist. This EPD reports environmental impacts based on established life cycle impact assessment 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 product in this EPD conforms to ASTM D9-09ae1. EPDs do not report product environmental performance against any benchmark.

Type III environmental product declarations intended for business-to-consumer communication shall be available to the consumer at the point of purchase (ISO 14025:2006, 9.2.2).

Product System

Product Description

Roseburg's I-joist is manufactured in Riddle, Oregon in a variety of dimensions and grades and is marketed and sold under the trademark name RFPI® Joist. Primary application categories of I-joist include flooring and roofing construction. The 2014 production data used in this EPD considers all I-joist produced during the year and is therefore weighted based on material output. The production data used in this EPD is presented in cubic meters, but includes the following possible dimensions:

- Lengths: 12' - 66' (even numbered feet only)
- Widths: 9-1/2", 11-7/8", 14", 16", 18", 20", 22", 24"
- Thicknesses:
    - 1-3/4" x 1-3/8" flange, 3/8" web
    - 2-1/16" x 1-3/8" flange, 3/8" web
    - 2-5/16" x 1-3/8" flange, 3/8" web
    - 2-5/16" x 1-1/2" flange, 3/8" web
    - 2-5/16" x 1-1/2" flange, 7/16" web
    - 2-1/2" x 1-1/2" flange, 3/8" web
    - 3-1/2" x 1-1/2" flange, 7/16" web
    - 3-1/2" x 1-1/2" flange, 3/8" web

All flanges used in Roseburg's I-joists are made from Douglas-fir lumber or laminated veneer lumber. Douglas-fir is abundant in the Pacific Northwest, where the majority of Roseburg's log and veneer supply originate.

Application and Technical Data

In North America, I-joists are applicable in a variety of end uses, including residential and non-residential construction, improvements, and mobile homes.

Production

The upstream forest operations include forest management, logging, planting, and loading the harvested roundwood onto a truck. The roundwood is then transported from the forest road to the mill, which includes the log yard and the sawmill. At the sawmill, the logs are debarked and sawed into smaller sizes, producing green wood. The manufacturing process for RFPI-joists involves gluing together two flanges (either solid sawn, or LVL) with a web, which is typically oriented strand board. Finally, the product is packaged for shipping. All of these processes require electricity, fuels, and wood inputs as biomass fuel.

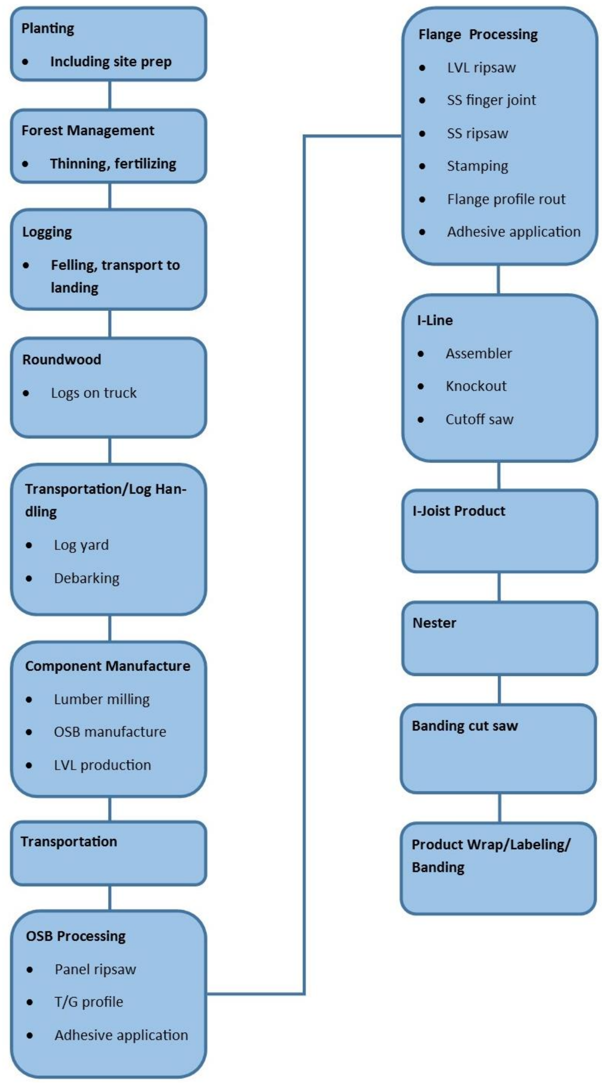

Figure 1: Cradle-to-gate product system for I-joist

Methodology of the Underlying LCA

Declared Unit

The declared unit is 1 m of I-joist. This corresponds to a reference flow of 3.90 oven-dry kilograms. The dimensions of the flange of this I-joist range from 1-3/4" to 2-1/2" by 1-3/8" to 1-1/2", and 3/8" to 7/16" for the web. I-joist produced in North America is understood to have some moisture in the product, while the oven-dry unit of measure contains no moisture. The average moisture content of I-joist is 8% (wet basis). The composition of the I-joist is shown in Table 1.

Table 1: Material composition

Material	Mass (oven-dry basis) [kg]	Mass [%]
Wood	3.51	90
Phenol formaldehyde resin	0.351-0.390	9-10
Sealers	0.00390	0.01

No hazardous materials are contained in, or result from the production of, any of the products assessed in this study.

System Boundaries

As shown in Figure 2, the cradle-to-gate system boundary includes the extraction of raw materials and processing; the transportation of raw materials, secondary materials, and any fuels from the extraction site to the manufacturing site; and the manufacturing of the wood construction product, including any necessary packaging. All other life cycle stages are excluded from the analysis, denoted by MND or "module not declared."

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE			
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Figure 2: Life cycle stages of wood products (those included are marked with an 'x')

Cut-off Rules

The cut-off criteria for flows to be considered within the system boundary are as follows:

- Mass – in case of insufficient data or data gaps, flows less than 1% of the cumulative mass of a unit process may be excluded, provided its environmental relevance is minor;
- Energy – in case of insufficient data or data gaps, flows less than 1% of the cumulative energy of a unit process may be excluded, provided its environmental relevance is minor;
- Environmental relevance – if a flow meets the above two criteria, but is determined to contribute 2% or more to the selected impact categories of the products underlying the EPD, based on a sensitivity analysis, it is included within the system boundary.
- At least 95% of the total mass and energy flows of all the modules involved in the system boundary of the underlying LCA shall be included and the life cycle impact data shall contain at least 95% of all elementary flows that contribute to each of the declared category indicators.

No cut-off criteria had to be applied for this study.

Background Data

Background data for upstream and downstream data are representative of the years 2010 to 2016 and were obtained from the GaBi 2017 databases (thinkstep, 2017).

Data Quality

All primary data obtained from Roseburg, which covers process inputs and outputs as well as those for any on-site co-generation or boiler processes, are considered to be very good. The most significant background datasets used, those for forestry operations and energy, are considered to be good as they are technologically, geographically, and temporally relevant. It should be noted that forestry operations data come from the USLCI database and are the best available, though they are more than 10 years old.

Period under Review

This study is intended to represent production for the year 2014.

Region under Review

I-joist production occurs at Roseburg's facility in Riddle, Oregon.

Treatment of Biogenic Carbon

As the system boundary of this study is cradle-to-gate, biogenic carbon emissions were excluded from the global warming potential results, in accordance with the PCR.

Carbon sequestered in the wood product at its end-of-life was not included in the global warming potential calculations as it was outside the system boundary of the study. Estimates of the expected carbon sequestration for average use and end-of-life treatment is provided in the Additional Information section.

Allocation

Multi-output allocation generally follows the requirements of ISO 14044, Section 4.3.4.2. The method of multi-output allocation was determined based on the requirements and guidance of ISO 14044:2006, clause 4.3.4, and additionally considers the following as per the PCR:

"Allocation of multi-output processes should be based on physical properties (e.g., mass or volume) when the main product and co-products generate more or less the same revenues, i.e., when the difference in revenue from a main product and co-products is low. However, if the difference in revenues between the main product and co-products from a multi-output process is more than 10%, allocation shall be based on the revenue and the deviation from the physical allocation shall be substantiated and readily available for critical review of the LCA study. In all cases, material inherent properties such as biogenic carbon, water, and energy content are allocated according to their physical flows, i.e., by mass."

This allocation method applies both to wood waste as an output and as an input (i.e. wood waste used in particleboard manufacturing). The study found that none of the prices of the co-products exceed that of the primary product by more than 10%. Therefore, mass allocation was utilized. This method aligns with industry-average EPDs on the products under study.

Comparability

A comparison or evaluation of EPD data is only possible if all data sets to be compared are 1) created according to EN 15804 and 2) are considered in a whole building context or utilize identical defined use stage scenarios. Comparisons are only allowable when EPDs report cradle-to-grave information using a functional unit. Refer to section 5.3 of EN 15804 for further information.

Life Cycle Assessment Results

The impact categories presented represent impact potentials, i.e., they are approximations of environmental impacts that could occur if the emissions would (a) actually follow the underlying impact pathway and (b) meet certain conditions in the receiving environment while doing so. In addition, the inventory only captures that fraction of the total environmental load that corresponds to the functional unit (relative approach). LCIA results are therefore relative expressions only and do not predict actual impacts, the exceeding of thresholds, safety margins, or risks.

Table 2 depicts the totals for the impact indicators, in addition to energy, resources, and waste results for 1 m. The dimensions of the flange of this I-joist range from 1-3/4” to 2-1/2” by 1-3/8” to 1-1/2”, and 3/8” to 7/16” for the web. All environmental impact indicators were assessed using the TRACI 2.1 method. Wood as a raw material is the single greatest contributor to all of the impact indicators shown below, as it includes the upstream impacts of LVL, lumber, and OSB.

Table 2: Impact category results

Indicator	Unit (per m)	A1-A3
Impact categories		
Global Warming Potential (excluding biogenic carbon)	kg CO_2 equiv	1.82
Acidification Potential	kg SO_2 equiv	0.0123
Eutrophication Potential	kg N equiv	7.24E-04
Smog Formation Potential	kg O_3 equiv	0.251
Ozone Depletion Potential	kg CFC-11 equiv	1.09E-09
Primary energy consumption		
Total primary energy consumption	*MJ*	48.6
Non-renewable fossil	MJ	32.9
Non-renewable nuclear	MJ	1.67
Renewable (solar, wind, hydroelectric and geothermal)	MJ	2.11
Renewable (biomass)	MJ	11.9
Material resources consumption		
Non-renewable materials	kg	0.789
Renewable materials	kg	12.3
Fresh water	L	10.2
Waste materials		
Hazardous waste	kg	3.71E-08
Non-hazardous waste	kg	0.0294

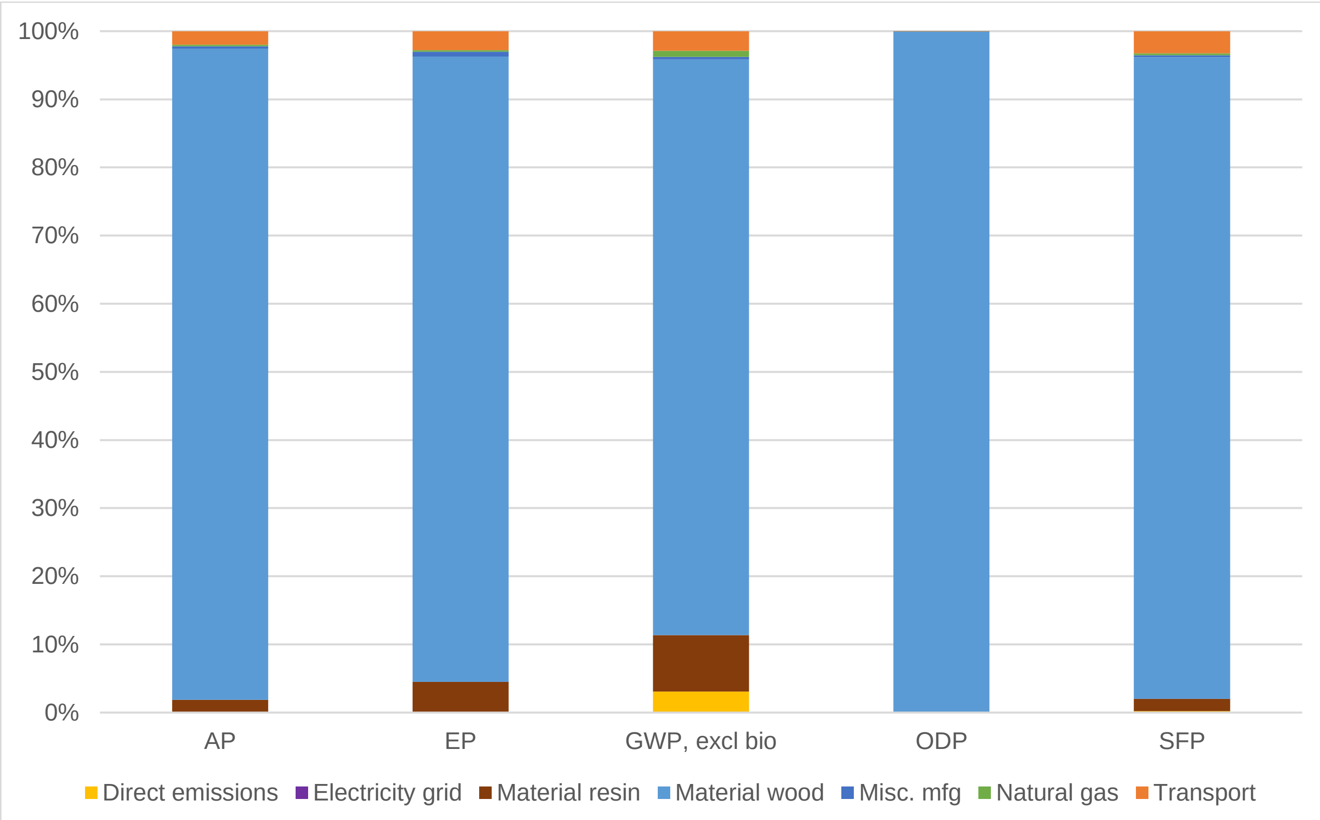

Figure 3: Cradle-to-gate impact assessment results

Additional Environmental Information

Carbon Sequestration

Per the PCR, the carbon stored in the product after final disposal was estimated using the B2B FPInnovations PCR Carbon Sequestration Calculator (2.18). Table 3 details the carbon dioxide that is sequestered in the product at the gate of the manufacturing stage, the total carbon dioxide and methane emissions associated with the estimated end-of-life scenario provided by the calculator, and finally, the net sequestration of greenhouse gas emissions that could potentially be associated with the product. Were a cradle-to-grave system boundary used instead, this credit could be accounted for in the total GWP of the products.

Table 3: Carbon storage of I-joist product

Metric	Wood content	Wood mass	Carbon sequestered in product at gate	Emissions from estimated EoL treatment		Sequestration, net of greenhouse gas emissions
Unit	*%*	*kg*	*kg CO_2-eq.*	*kg CO_2*	*kg CH_4*	*kg CO_2-eq.*
I-joist	90%	3.51	-6.44	1.49	0.02	-4.44

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LCA Development

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