MAGLIN™
Site Furniture

Environmental Product Declaration

Environmental Product Declaration for Aries Series Chairs produced by Maglin Site Furniture at their facility in Woodstock, ON, Canada.

ADMINISTRATIVE INFORMATION

International Certified Environmental Product Declaration

Declared Product:	This Environmental Product Declaration (EPD) covers bench products produced by Maglin Site Furniture. Declared unit: 1 modular bench configuration
Declaration Owner:	Maglin Site Furniture 3-468 Innovation Way Woodstock, ON www.maglin.com
Program Operator:	Labeling Sustainability 11670 W Sunset Blvd Los Angeles, CA 90049 www.labelingsustainability.com
Product Category Rule:	ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services and Sub Product Category Rule for Site Furnishings, CSI MasterFormat, Section 32 33 00 PCR Program Operator: Labeling Sustainability PCR review was conducted by: Geoffrey Guest, Ph.D.
Independent LCA Reviewer and EPD Verifier:	This declaration was independently verified in accordance with ISO 14025:2006. Independent verification of the declaration, according to ISO 14025:2006. Internal ☐ ; External ☐ X Third Party Verifier Geoffrey Guest, Certified 3rd Party Verifier under the Labeling Sustainability Program (www.labelingsustainability.com), CSA Group (www.csaregistries.ca)
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COMPANY DESCRIPTION

In 1983 Ian McAskile was inside crafting home furnishings, and the inspiration struck to take his craft outdoors. He knew from extensive experience that the indoors shows you walls. However, the outdoors serves the wonders – and those who want to make their exterior environment stunning and sustainable deserve to work with people with the same passion. Enter Maglin (named after Ian's daughters, Maggie and Lindsay), a site furniture company made to meet the need for contemporary outdoor amenities that are aesthetically pleasing while environmentally friendly. From benches, bollards, bike racks, and receptacles to panels, planters, tables, chairs, custom projects, and more — Maglin Sit Furniture strategically configures and thoughtfully customizes adaptable solutions that will enhance any area.

Maglin continues to grow both as a company — offering new and expanding product lines in response to the needs of its clients, but also as a corporate citizen — building social consciousness into its operation; from supporting a variety of charitable causes, facilitating staff dialogue about diversity issues, to reevaluating our manufacturing process to strive for increasingly environmentally kind products.

STUDY GOAL

The intended application of this life cycle assessment (LCA) is to comply with the procedures for creating a Type III environmental product declaration (EPD) and publish the EPD for public review on the website, www.labelingsustainability.com. This level of study is in accordance with EPD Product Category Rule (PCR) for Chairs published by ; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations-Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework. The performance of this study and its subsequent publishing is in alignment with the business-to-business (B2B) communication requirements for the environmental assessment of building products. The study does not intend to support comparative assertions and is intended to be disclosed to the public.

This project report was commissioned to differentiate Maglin Site Furniture from their competition for the following reasons: generate an advantage for the organization; offer customers information to help them make informed product decisions; improve the environmental performance of Maglin Site Furniture by continuously measuring, controlling and reducing the environmental impacts of their products; help project facilitators working on Leadership in Energy and Environmental Design (LEED) projects achieve their credit goal; and to strengthen Maglin Site Furniture's license to operate in the community. The intended audience for this LCA report is Maglin Site Furniture's employees, their suppliers, project specifiers of their products, architects, and engineers. The EPD report is also available for policy makers, government officials interested in sustainability, academic professors, and LCA professionals. This LCA report does not include product comparisons from other facilities.

DESCRIPTION OF PRODUCT AND SCOPE

Maglin chairs come in various options to meet their customers' project needs. This makes it difficult to capture every possible chair option that could be manufactured and sold by Maglin for a project. To accomplish this goal, this EPD reports using two different methods:

1. The average method. This method is detailed in ISO 21930:2017, Section 5.3 Average EPDs for similar products groups.
2. A representative product is chosen for a product line. When applicable, all variations of the product plus or minus 10% are included in this average value.
3. The "low" and "high" option by mass weight.

The range method of reporting a complete product line is different from modeling just an average product for that range with a tolerance of plus or minus 10% deviation from the average product modeled. Using the range method allows manufacturers to capture a full product line within that range and understand the impacts of their options and product series add-ons. This method is compliant with the primary PCR for this EPD, ISO 21930: 2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services, and the sub-PCR, Sub Product Category Rule for Site Furnishings, CSI MasterFormat, Section 323300. Per the sub-PCR, the following statements describe the process for determining a product range and including the products. "By performing a realistic range for modeling hundreds of combinations of a piece of furniture also allows for longevity of the EPD by keeping up with the design aesthetic and customizing furniture. For the future options to be included in this EPD, they must appear on the list of features considered when creating the low and high options. The lowest and highest option shall be reported along with an average of the two when reporting the impacts. A complete table with the product's technical attributes, as defined in the Section on the Product Description, must be listed for the base case and worst cases with a complete Bill of Materials (BOM) to .1% by weight. If the impacts from the low, high, and average differ by more than 10%, an explanation must be included as part of the reporting. Similar products that vary less than 10% between models due to finished or mounting options can be included but noted. The table below outlines each product line's high and low options and the list of included models in that range.

Chairs with differences between the high and low that are greater than 10% by mass are based on the different sizes available or options. Primary materials remain the same between the two variations.

The functional unit considers an entire product unit.

Maglin standard paint colors include the following: Fine Textured (Preferred for all cast aluminum products)-Silver, Evergreen, Black, Gunmetal, Bronze, Slate, Titanium Gloss- Silver, Evergreen, Black, Gunmetal, Bronze, Graphite, Titanium.

The product descriptions in the table below outline the products and options used to calculate each category range. The PCR states the inclusion of product ranges must follow these guidelines:

"The range of products as an acceptable reporting method for this PCR is detailed in the Product Description. This is different from an average EPD, where one"typical" product is modeled and represents all variations within 10% of it. By performing a realistic range for modeling hundreds of combinations of a piece of furniture also allows for longevity of the EPD by keeping up with the design

aesthetic and customizing furniture. For the future options to be included in this EPD, they must appear on the list of features considered when creating the low and high options. The lowest and highest option shall be reported along with an average of the two when reporting the impacts."

This EPD shall cover all products within the low/high range. Those products shall share the same nomenclature, such as Product Group-model number, and shall fall within the range weight. Products included in the "average" perimeter shall be within 10% +/- of the listed weight and follow the same nomenclature Product Group-model number.

This LCA assumes the impacts from products manufactured in accordance with the standards outlined in this report. This LCA is a cradle-to-grave study.

CHAIRS DESIGN SUMMARY

The following tables provide a list of the chairs products considered in this EPD along with key performance parameters.

Table 1: **Declared products with Aries Series considered in this environmental product declaration**

Prod#	Unique name/ID	Short description	Product type	Unit	Density, dry kg/Unit	bio-carbon content, kg C/FU dry basis
1	MCH-3500-00001	Aries Chair, no arms	Chair	piece	8.31	0.00
2	MCH-3500-00002	Aries Chair, arms	Chair	piece	9.61	0.00

Prod#	Unique name/ID	productGroup	Height (cm)	Length (cm)	Width (cm)
1	MCH-3500-00001	ARIES	84.5	57.5	54.6
2	MCH-3500-00002	ARIES	84.5	57.5	62.2

A1 RAW MATERIAL RECYCLED CONTENT AND MATERIAL LOSSES

The following table provides a list of the raw material inputs (module A1) across all products considered, their recyclability content and assumed material losses.

Table 2: **Module A1 raw material inputs, the recyclability content and assumed material losses (dry basis)**

product.name	mix.category	primary. content	post.industrial. content	post.consumer. content	material .losses
Recycled HDPE	Polyethylene, high density, granulate, recycled	0%	100%	0%	2%
Recycled HDPE	Polyethylene, high density, granulate, recycled	0%	100%	0%	2%
Pallet	EUR-flat pallet	0%	0%	100%	2%
Recycled steel	Steel, low-alloyed	0%	44%	14%	2%
Recycled steel	Steel, low-alloyed	0%	44%	14%	2%
Recycled aluminium	Aluminium, wrought alloy	0%	41%	24%	2%
Recycled aluminium	Aluminium, wrought alloy	0%	41%	24%	2%
Recycled stainless steel	Steel, chromium steel 18/8	0%	100%	0%	2%

SYSTEM BOUNDARIES

The following figure depicts the cradle-to-grave system boundary considered in this study:

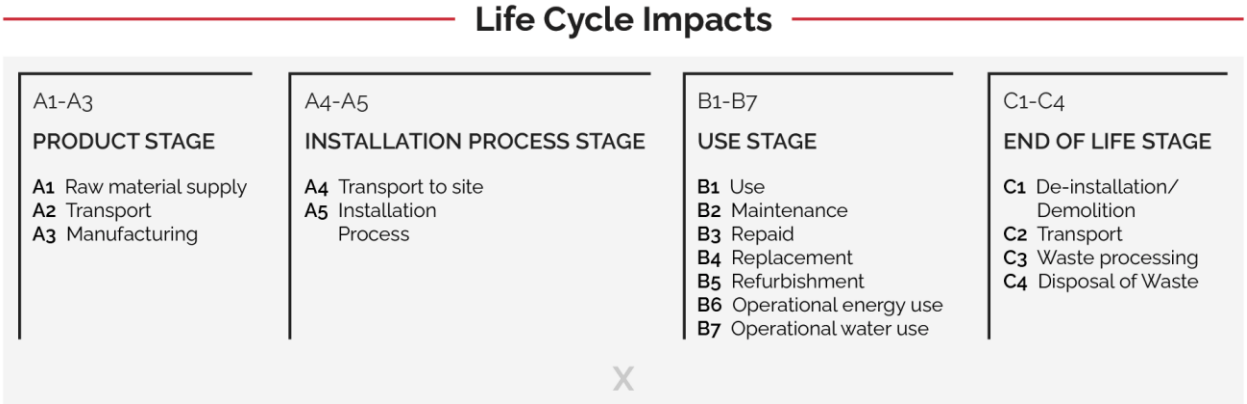

Figure 1: **General life cycle phases for consideration in a construction works system**

This is a Cradle-to-grave life cycle assessment, and the following life cycle stages are included in the study:

- A1: Raw material supply (upstream processes) - Extraction, handling, and processing of the materials used in manufacturing the declared products in this LCA.
- A2: Transportation - Transportation of A1 materials from the supplier to the "gate" of the manufacturing facility (i.e., A3).
- A3: Manufacturing (core processes)- The energy and other utility inputs used to store, move, and manufacture the declared products and to operate the facility.
- A4: Product plant gate-to-site of use logistics
- A5: Product at-site installation requirements
- B: Product use phase requirements and direct emissions (if applicable)
- C: Product end-of-life requirements

As according to the PCR, the following figure illustrates the general activities and input requirements for producing bench products and is not necessarily exhaustive.

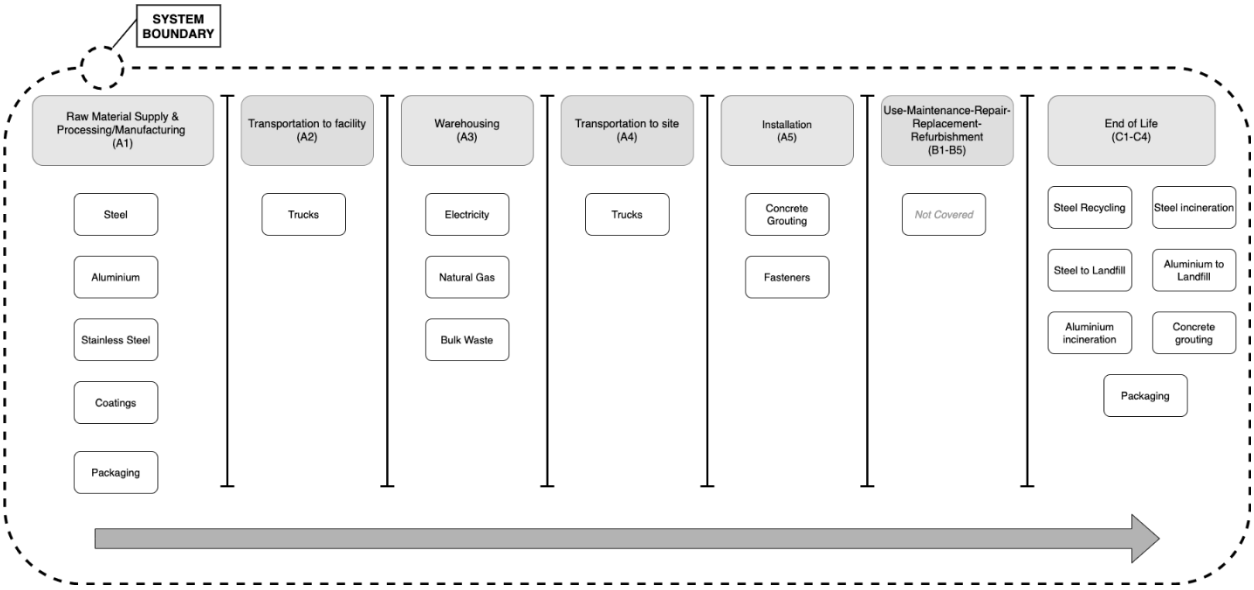

Figure 2: **General system inputs considered in the product system and categorized by modules in scope**

In addition, as according to the relevant PCR, the following requirements are excluded from this study:

- Production, manufacture, and construction of A3 building/capital goods and infrastructure;
- Production and manufacture of steel production equipment, steel delivery vehicles, earthmoving equipment, and laboratory equipment;
- Personnel-related activities (travel, furniture, office supplies)
- Energy use related to company management and sales activities.

For this LCA the manufacturing plant, owned and operated by Maglin Site Furniture, is located at their Chairs facility in Ontario. All operating data is formulated using the actual data from Maglin Site Furniture's plant at the above location, including water, energy consumption and waste generation. All inputs for this system boundary are calculated for the plant.

This life cycle inventory was organized in a spreadsheet and was then input into an RStudio environment where pre-calculated LCIA results for relevant products/activities stemming from the ecoinvent v3.10 database and a local EPD database in combination with primary data from Maglin Site Furniture were utilized. Explanations of the contribution of each data source to this study are outlined in the section 'Data Sources and Quality'. Further LCI details for each declared product are provided in the sections 'Detailed LCI tables' and 'Transport tables' of the detailed LCA report. A parameter uncertainty analysis was also performed where key statistical results (e.g. min/mean/max etc.) are provided in the detailed LCA report.

No known flows are deliberately excluded from this EPD.

CUT-OFF CRITERIA

ISO 14044:2006 and the focus PCR require the LCA model to contain a minimum of 95% of the total inflows (mass and energy) to the upstream and core modules be included in this study. The cut-off criteria were applied to all other processes unless otherwise noted above. A 1% cut-off is considered for all renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process where the neglected inputs do not exceed 5%.

DATA SOURCES AND DATA QUALITY ASSESSMENT

No recovered on-site energy occurs at this facility.

No re-used or recycled material for utilization on-site or off-site was reported at this facility.

The following statements explain how the above facility requirements/generation were derived:

Raw material transport: Maglin does not produce 100% of the materials for their products in-house; they primarily prep and assemble products manufactured by outside vendors. Maglin used engineering drawings to determine the exact parts and weights for each product. The pieces were then further refined by a supplier. When multiple suppliers can manufacture the same part, allocation by purchased percentage during the reference period was used to determine transportation distances and geographical reference data. All raw material inputs are not primary information, and the ecoinvent database was used to model their raw material inputs and manufacturing processes. For example, transportation between suppliers and Maglin was primary information provided by Maglin.

Once Maglin receives the specific part, it is prepped and then transferred to a coating manufacturer. Maglin uses three types of coatings. First, E-Coat is used on steel or aluminum before powder coating. E-Coat is applying a coating with an electrical current onto the material. The process is standard in the automotive industry but can vary for each supplier. Three (3) main stages are typical: Pre-treatment, E-Coat, and Curing. The Pre-treatment stage includes cleaning, pre-treatment, and rinsing. The second stage is E-Coating Process. The final step is Post Rinse and Baking. This wet film process allows the coating to get into interior recesses and cavities (similar to galvanizing), which makes it superior to a Prime base coat in most instances. The result is a flat black finish and is ready to receive the powder coating.

Aluminum parts receive an alodine treatment before powder coating. The alodine method used on Maglin products is a military specification developed and used by the US department of defense to boost corrosion resistance and provide a good base for the subsequent application of paint. The finish is clear. There is a size limitation with alodine because it is a batch process versus a line system in e-coating, so Maglin only processes smaller aluminum parts. Once properly treated, they are transported by truck back to Maglin, where they will be inspected and transported to the powder coating facilities.

Electricity: Primary electricity consumption was calculated for the Maglin facility from electricity bills. Since 2020 was an uncommon year due to the pandemic, 12 consecutive months were used starting in June 2023 to July 2024. Maglin's utility provider provides monthly usage in kilowatt-hours (kWh) so no conversions were performed. Allotment of utilities was calculated first by determining the product

percentage by sales volume. Next, that allotment was then divided by the number of components produced.

Process/space heating: The facility is heated by natural gas. All direct usage, as reported in monthly utility bills, was reported. Since 2020 was an uncommon year due to the pandemic, 12 consecutive months were used, from June 2021 to July 2022. Natural gas is reported in m3 of usage. The conversion factor used for m3 to MJ to represent the burning of the natural gas was 1 m3 of natural gas= 38.3 MJ of energy. Allotment of utilities was calculated first by determining the product percentage by sales volume. Next, that allotment was then divided by the number of components produced.

Fuel required for machinery: On-site machinery for moving materials uses electricity; therefore, no additional fuel usage was reported.

Waste generation: All waste was calculated using primary information from Maglin utility bills. Transportation defaults were used because the driver route and ultimate final destination are unknown. Exact mileage could not be confirmed by the waste hauler.

Recovered energy: No on-site energy is recovered on site.

Recycled/reused material/components: According to the Advancing Sustainable Materials Management: 2018 Fact Sheet (US EPA), only 14% of the total plastic packaging and 81% of paper/cardboard packaging is recycled in the USA, and hence, this value was considered to be the same for Canada. Similarly, 7% Plastic and 24% steel components of the waste receptacles were assumed to be recycled off-site at the end of their service life. However, it is assumed that 98% of steel sent to the incinerator is collected from the bottom ash and recycled (Rainer Bunge 2016).

Module A1 material losses: Default material losses were used.

Direct A3 emissions accounting: Direct emissions for on-site natural gas heating was based on a representative ecoinvent process.

A4 Product transport requirements: Maglin reported the average customer distance based on direct calculations of distance and number of chairs purchased from purchased orders. For example, the distance of 1,058 km is a representative distance a product is trucked to a customer.

A5 product installation: Maglin provides its clients with installation documents that detail the various methods which could be adopted to install their products. For modular bench configurations, it has been assumed that all bench products were installed using 3/8" Anchor bolts which were accounted for as a raw material input. Since modular bench configurations are installed manually, no additional process energy or material requirements were assumed for the installation phase.

B product use phase: No use phase material or energy inputs for chairs were assumed in this study.

C product end-of-life: To determine end-of-life in this study, it is assumed that 60% of the steel components of the chairs will be sent to a landfill at the end of its service life and about 13% is incinerated. However, 98% of the steel components sent to the incinerator are collected from the bottom ash and then recycled. This assumption has been made based on the Advancing Sustainable Materials Management: 2018 Fact Sheet (US EPA). Similar end-of-life disposal values for wood and

plastics were also derived from the Advancing Sustainable Materials Management: 2018 Fact Sheet (US EPA). Maglin has been in business for 40 years; therefore, they do not have direct knowledge of what their customers would do at the end of the estimated service life of 50 years.

The following tables depict a list of assumed life cycle inventory utilized in the LCA modeling to generate the impact results across the life cycle modules in scope. An assessment of the quality of each LCI activities utilized from various sources is also provided.

Table 3: **LCI inputs assumed for module A1 (i.e., raw material supply) Data Quality Assessment Key Poor=0, Fair=1, Good=2, Very Good =3.**

Input	LCI.activity	Data.source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Pallet	EUR-flat pallet production/EUR-flat pallet/RoW/unit	ecoinvent v3.10 in 2024	Ontario	2024	1	3	1	3	3
Cardboard /Paper packaging	corrugated board box production/corrugated board box/RoW/kg	ecoinvent v3.10 in 2024	Ohio	2024	1	3	1	3	3
Recycled stainless steel	steel production, electric, chromium steel 18-8/steel, chromium steel 18-8/RoW/kg	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3
Primary steel	steel production, converter, low-alloyed/steel, low-alloyed/RoW/kg	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3
Ipe	planing, board, hardwood, u=20%/sawnwood, board, hardwood, dried (u=20%), planed/RoW/m3	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3
Metal Working, aluminium	metal working, average for aluminium product manufacturing/metal working, average for aluminium product manufacturing/RoW/kg	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3
Recycled HDPE	polyethylene production, high density, granulate, recycled/polyethylene, high density, granulate, recycled/RoW/kg	ecoinvent v3.10 in 2024	Wisconsin	2024	2	3	2	3	3
Recycled steel	steel production, electric, low-	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3

	alloyed/steel, low-alloyed/RoW/kg								
Primary stainless steel	steel production, converter, chromium steel 18-8/steel, chromium steel 18-8/RoW/kg	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3
Recycled aluminium	treatment of aluminium scrap, new, at remelter/aluminium, wrought alloy/RoW/kg	ecoinvent v3.10 in 2024	Ontario	2024	1	3	2	3	3
Metal Working, Steel	metal working, average for steel product manufacturing/metal working, average for steel product manufacturing/RoW/kg	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3
Primary aluminium	aluminium alloy production, AlMg3/aluminium alloy, AlMg3/RoW/kg	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3
HDPE	polyethylene production, high density, granulate/polyethylene, high density, granulate/RoW/kg	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3

Table 4: **LCI inputs assumed for module A2 (i.e., transport of A1 inputs) Data Quality Assessment Key Poor=0, Fair=1, Good=2, Very Good =3.**

Input	LCI.activity	Data.source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Ash- freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Bulk Waste-freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3

Cardboard/ Paper packaging- freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
HDPE- freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Ipe- freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Metal Working, aluminium- freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Metal Working, Steel- freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Plastic Packaging- freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Primary aluminium- freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Primary stainless steel- freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Primary steel- freight	market for transport, freight, lorry >32 metric ton, EURO6/transport,	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3

transport via Truck	freight, lorry >32 metric ton, EURO6/RoW/tkm								
Recycled aluminium-freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Recycled HDPE-freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Recycled stainless steel-freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3
Recycled steel-freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	RoW	2024	2	3	1	3	3

Table 5: **LCI inputs assumed for module A3. Data Quality Assessment Key Poor=0, Fair=1, Good=2, Very Good =3.**

Input	LCI.activity	Data.source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Bulk Waste	process-specific burdens, inert material landfill/process-specific burdens, inert material landfill/RoW/kg	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3
Electricity	market for electricity, medium voltage/electricity, medium voltage/CA-ON/kWh	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3

Natural Gas	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3
Plastic Packaging	packaging film production, low density polyethylene/packaging film, low density polyethylene/RoW/kg	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3
Powder Coating, aluminum	powder coating, aluminium sheet/powder coat, aluminium sheet/RoW/m2	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3
Powder Coating, steel	powder coating, steel/powder coat, steel/RoW/m2	ecoinvent v3.10 in 2024	Ontario	2024	2	3	2	3	3

Table 6: **LCI inputs assumed across modules A4 to C4 (i.e., from plant gate-to-grave if applicable) Data Quality Assessment Key Poor=0, Fair=1, Good=2, Very Good =3.**

Input	LCI.activity	Data.source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
C3. Cardboard packaging waste	waste to sorting center for recycling	See A3 inputs	Ontario	See A3 inputs	1	A3	2	A3	A3
C2. Cardboard packaging waste-freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3
C3. Incinerated Waste aluminium components	waste/scrap to sorting center for recycling	See A3 inputs	Ontario	See A3 inputs	1	A3	1	A3	A3
C2. Incinerated Waste aluminium components - freight	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3

transport via Truck									
C3. Incinerated Waste steel components	waste/scrap to sorting center for recycling	See A3 inputs	Ontario	See A3 inputs	1	A3	1	A3	A3
C2. Incinerated Waste steel components - freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3
C3. Landfill Waste aluminium components	waste/scrap to sorting center for recycling	See A3 inputs	Ontario	See A3 inputs	1	A3	1	A3	A3
C2. Landfill Waste aluminium components - freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3
C3. Landfill Waste steel components	waste/scrap to sorting center for recycling	See A3 inputs	Ontario	See A3 inputs	1	A3	1	A3	A3
C2. Landfill Waste steel components - freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3
C3. Plastic Packaging waste	waste/scrap to sorting center for recycling	See A3 inputs	Ontario	See A3 inputs	1	A3	1	A3	A3
C2. Plastic Packaging waste-freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3
A4. Truck Transport	Product-to-site transport requirements	See A4 transport requirements	Ontario	2020-06-01 to 2021-05-31	NA	NA	NA	NA	NA
A4. Truck Transport-freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3
C3. Waste HDPE to incinerator	waste to sorting center for recycling	See A3 inputs	Ontario	See A3 inputs	1	A3	2	A3	A3
C2. Waste HDPE to incinerator-freight	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3

transport via Truck									
C3. Waste HDPE to landfill	waste to sorting center for recycling	See A3 inputs	Ontario	See A3 inputs	1	A3	2	A3	A3
C2. Waste HDPE to landfill-freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3
C3. Waste wood to incinerator	waste to sorting center for recycling	See A3 inputs	Ontario	See A3 inputs	1	A3	2	A3	A3
C2. Waste wood to incinerator-freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3
C3. Waste wood to landfill	waste to sorting center for recycling	See A3 inputs	Ontario	See A3 inputs	1	A3	2	A3	A3
C2. Waste wood to landfill-freight transport via Truck	market for transport, freight, lorry >32 metric ton, EURO6/transport, freight, lorry >32 metric ton, EURO6/RoW/tkm	ecoinvent v3.10 in 2024	see corrsp. product input above	2024	2	3	1	3	3

DATA QUALITY ASSESSMENT

Data quality/variability requirements, as specified in the PCR, are applied. This section describes the achieved data quality relative to the ISO 14044:2006 requirements. Data quality is judged based on its precision (measured, calculated, or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied within a study serving as a data source), and representativeness (geographical, temporal, and technological).

Precision: Through measurement and calculation, the manufacturers collected and provided primary data on their annual production. For accuracy, the LCA practitioner and 3rd Party Verifier validated the plant gate-to-gate data.

Completeness: All relevant specific processes, including inputs (raw materials, energy and ancillary materials) and outputs (emissions and production volume) were considered and modeled to represent the specified and declared products. The majority of relevant background materials and processes were taken from ecoinvent v3.10 LCI datasets where relatively recent region-specific electricity inputs were utilized. The most relevant EPDs requiring key A1 inputs were also utilized where readily available.

Consistency: To ensure consistency, the same modeling structure across the respective product systems was utilized for all inputs, which consisted of raw material inputs and ancillary material, energy flows, water resource inputs, product and co-products outputs, returned and recovered Bench materials, emissions to air, water and soil, and waste recycling and treatment. The same background LCI datasets from the ecoinvent v3.10 database were used across all product systems. Crosschecks

concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the plant and selected process level to maintain a high level of consistency.

Reproducibility: Internal reproducibility is possible since the data and the models are stored and available in a machine readable project file for all foreground and background processes, and in Labeling Sustainability's proprietary Bench LCA calculator* for all production facility and product-specific calculations. A considerable level of transparency is provided throughout the detailed LCA report as the specifications and material quantity make-up for the declared products are presented and key primary and secondary LCI data sources are summarized. The provision of more detailed publicly accessible data to allow full external reproducibility was not possible due to reasons of confidentiality.

*Labeling Sustainability has developed a proprietary tool that allows the calculation of PCR-compliant LCA results for Bench product designs. The tool auto-calculates results by scaling base-unit technosphere inputs (i.e. 1 kg sand, 1 kWh electricity, etc.) to replicate the reference flow conversions that take place in any typical LCA software like openLCA or SimaPro. The tool was tested against several LCAs performed in openLCA and the tool generated identical results to those realized in openLCA across every impact category and inventory metric (where comparisons could be readily made)..

Representativeness: The representativeness of the data is summarized as follows.

- Time-related coverage of the manufacturing processes' primary collected data from 2021-06-01 to 2022-07-31.
- Upstream (background) LCI data was either the PCR specified default (if applicable) or more appropriate LCI datasets found in the country-adjusted ecoinvent v3.10 database.
- Geographical coverage for inputs required by the A3 facility(ies) represents its region of focus; other upstream and background processes are based on US, North American, or global average data and adjusted to regional electricity mixes when relevant.
- Technological coverage is typical or average and specific to the participating facilities for all primary data.

ENVIRONMENTAL INDICATORS AND INVENTORY METRICS

Per the PCR, this EPD supports the life cycle impact assessment and inventory metrics listed in the tables below. As specified in the PCR, the most recent US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), impact categories were utilized to provide a North American context for the mandatory category indicators to be included in the EPD. Additionally, the PCR requires a set of inventory metrics to be reported with the LCIA indicators (see tables below).

Table 7: **Life cycle impact categories and life cycle inventory metrics**

ID	LCIA.indicators	Abbreviations	Units
1	Climate change: global warming potential (GWP100)	GWP100	kg CO2-eq
2	Ozone depletion: ozone depletion potential (ODP)	ODP	kg CFC-11-eq
3	Acidification: acidification potential (AP)	AP	kg SO2-eq
4	Eutrophication: eutrophication potential	EP	kg N-eq

5	Smog formation potential	SFP	kg O3-eq
6	Energy resources: non-renewable: abiotic depletion potential (ADP): fossil fuels	ADPfossil	MJ
Inventory metrics			
7	Inventory indicators ISO21930: Cumulative Energy Demand - renewable energy resources	RPRE	MJ
8	Inventory indicators ISO21930: Renewable primary resources with energy content used as material (i.e., PERM)	PRM	MJ
9	Inventory indicators ISO21930: Cumulative Energy Demand - non-renewable energy resources	NRPRE	MJ
10	Inventory indicators ISO21930: Non-renewable primary resources with energy content used as material (i.e., PENRM)	NRPRM	kg
11	Inventory indicators ISO21930: use of secondary material	SM	MJ
12	Inventory indicators ISO21930: use of renewable secondary fuels	RSF	MJ
13	Inventory indicators ISO21930: recovered energy	RE	MJ
14	Inventory indicators ISO21930: use of net fresh water	FW	m3
15	Inventory indicators ISO21930: hazardous waste disposed	HWD	kg
16	Inventory indicators ISO21930: non-hazardous waste disposed	NHWD	kg
17	Inventory indicators ISO21930: high-level radioactive waste disposed	HLRW	kg
18	Inventory indicators ISO21930: intermediate and low-level radioactive waste disposed	ILLRW	kg
19	Inventory indicators ISO21930: materials for recycling	MR	kg
20	Inventory indicators ISO21930: materials for energy recovery	MER	kg
21	Inventory indicators ISO21930: exported energy - electricity	EEel	MJ
22	Inventory indicators ISO21930: exported energy - heat	EEheat	MJ

It should be noted that emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in any of the following categories.

- Renewable primary energy resources as energy (fuel);
- Renewable primary resources as material;
- Non-renewable primary resources as energy (fuel);
- Non-renewable primary resources as material;
- Secondary Materials;
- Renewable secondary fuels;
- Non-renewable secondary fuels;
- Recovered energy;
- Abiotic depletion potential for non-fossil mineral resources.
- Land use related impacts, for example on biodiversity and/or soil fertility;
- Toxicological aspects;
- Emissions from land use change [GWP 100 (land-use change)];
- Hazardous waste disposed;

- Non-hazardous waste disposed;
- High-level radioactive waste;
- Intermediate and low-level radioactive waste;
- Components for reuse;
- Materials for recycling;
- Materials for energy recovery;
- Recovered energy exported from the product system.

TOTAL IMPACT SUMMARY

The following table reports the total LCA results for each product produced at the given chairs facility on a per 1 chair basis.

Table 8: **Total life cycle (across modules in scope) impact results for Aries Series, assuming the geometric mean point values on a per 1 chair basis.**

Midpoint Impact Categories:

Indicator/LCI Metric	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit	kg CO2-eq	kg CFC-11-eq	kg SO2-eq	kg N-eq	kg O3-eq	MJ
MCH-3500-00001	84.4	7.72e-07	0.293	0.264	3.97	899
MCH-3500-00002	90.5	8.23e-07	0.317	0.289	4.27	960

Resources Inventory Metrics:

Indicator/LCI Metric	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit	MJ	MJ	MJ	kg	MJ	MJ	MJ	m3
MCH-3500-00001	618	0	614	2.42	2.81	0.00947	2.29	11.3
MCH-3500-00002	623	0	620	2.42	3.61	0.0111	2.33	11.3

Waste/output Inventory Metrics:

Indicator/LCI Metric	HWD	NHWD	HLRW	ILLRW	MR	MER	EEel	EEheat
Unit	kg	kg	kg	kg	kg	kg	MJ	MJ
MCH-3500-00001	9.69	159	0.0742	0.0244	0.868	9.74e-05	2.19	0.129
MCH-3500-00002	11	188	0.0742	0.0244	1.15	0.000113	2.21	0.148

INTERPRETATION

The results are presented on a whole unit product basis.

ADDITIONAL ENVIRONMENTAL INFO

No regulated substances of very high concern are utilized on site.

"The Sub PCR, Sub Product Category Rule for Site Furnishings, CSI MasterFormat, Section 323300, states "A chemical schedule of hazardous materials and substances shall be included in the EPD report. The general cut-off rules do not apply to such substances. This includes paints, finishes, adhesives, and sealants. The EPD shall consist of a chemical schedule of all paints, finishes, adhesives,

and sealants used on the product rages, whether they appear in the LCA product model or not. Substances shall be listed by name, Chemical Abstract Registry Numbers (CAS RN), and hazard category according to the GreenScreen methodology. The finish schedule shall be completed to 0.1% or 1,000 ppm whenever possible."

Metal components of the Maglin chairs can be powder coated. The chemical inventory below is for the powder coating of their products. It covers the full color line with all work performed by an outside vendor. Maglin does not have operational control over the painting process. An average amount of powder coating per bench component ranges from 0.01 to 0.06 kilograms of coating.

Table 9: **Hazard Screening for Powder Coating Substances**

Substance (May Contain)	CAS RN	Weight by %	GreenScreen Score
1,3-Benzenedicarboxylic acid (May Contain)	1.214996e+12	< 10	LT – UNK: Present on a GreenScreen Specified List, but there is insufficient information to classify the hazard This material was added based on the Quartz database of common building materials. The manufacturer would not disclose any trade secrets therefore this material may or may not be in the actual product.
Aluminum Powder (May Contain)	7429-90-5	1634256000	BM1: Avoid - Chemical of High Concern
Amorphous silica (May Contain)	7631-86-9	< 3	BM1: Avoid - Chemical of High Concern
Aluminum hydroxide (May Contain)	21645-51-2	1635552000	BM 2: Use but Search for Substitutes
Titanium Dioxide (May Contain)	13463-67-7	25-30	LT-1: GreenScreen Benchmark-1 Avoid - Chemical of High Concern
1,3,5-Triglycidyl-s-triazinetrione (May Contain)	2451-62-9	1609804800	LT-1: GreenScreen Benchmark-1 Avoid - Chemical of High Concern
Quartz (May Contain)	14808-60-7	1615161600	LT-1: GreenScreen Benchmark-1 Avoid - Chemical of High Concern
Diiron Trioxide (May Contain)	1309-37-1	1614902400	BM1: Avoid - Chemical of High Concern
Silica gel (Main Contain)	112926-00-8	1615161600	LT – UNK: Present on a GreenScreen Specified List, but there is insufficient information to classify the hazard

REFERENCES

ISO Standards:

- ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms

- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)
- ISO 14025:2006 Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures
- ISO 14040:2006 Environmental Management - Life Cycle Assessment - Principles and Framework
- ISO 14044:2006 Environmental Management - Life Cycle Assessment - Requirements and Guidelines
- ISO 14067:2018 Greenhouse Gases – Carbon Footprint of Products – Requirements and Guidelines for Quantification
- ISO 14050:2009 Environmental Management - Vocabulary
- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products

EN Standards:

- EN 16757 Sustainability of construction works - Environmental product declarations – Product Category Rules for concrete and concrete elements
- EN 15804 Sustainability of construction works - Environmental product declarations -Core rules for the product category of construction products

Other References:

- USGBC LEED v4 for Building Design and Construction, 11 Jan 2019 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b
- USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b.
- US EPA (2020) Advancing Sustainable Materials Management: 2018 Fact Sheet, https://www.epa.gov/sites/production/files/2021-01/documents/2018_ff_fact_sheet_dec_2020_fnl_508.pdf