KEILHAUER

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner

Keilhauer
1450 Birchmount Rd
Toronto, ON, M1P 2E3
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Product

Symm Seating (SKU 93320)

(UNCPC Class 3811, Subclass 38119 - Other seats)

Functional Unit

One unit of seating to seat two (2) occupants, maintained for a 10-year period.

EPD Number and Period of Validity

SCS-EPD-10723
EPD Valid September 4, 2206 through September 3, 2031

Product Category Rule

NSF Product Category Rule for Environmental Product Declarations. NSF 1103-25. BIFMA PCR for Seating: UNCPC 3811 – Version 4. NSF International. Valid through January 31, 2030.

Program Operator

SCS Global Services
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SCSglobal SERVICES

Product name:	Symm Seating
Declaration Owner:	Keilhauer
Address:	1450 Birchmount Rd., Toronto, ON, M1P 2E3
Declaration Number:	SCS-EPD-10723
Declaration Validity Period:	September 4, 2026 through September 3, 2026
Year of Primary Manufacturing Data:	2023-24
Program Operator:	SCS Global Services
SCS GPI:	SCS Type III Environmental Declaration Program: Program Operator Manual. V12.0 December 2023.
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
This life cycle assessment was conducted in accordance with ISO 14044:2006/AMD 1:2007/AMD 2:2020 and the reference PCR by:	Gerard Mansell, Ph.D., SCS Consulting Services
LCA Software and LCI database:	OpenLCA v2.4 software and the Ecoinvent v3.12 database
Overall Data Quality Assessment Score:	2
Product RSL:	10 years
Markets of Applicability:	North America
Product Intended Application and Use:	Seating for a single individual
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-gate with options (A1-A5, B1, B4 and C1-C4)
Functional Unit:	One unit of seating to seat two (2) occupants, maintained for 10 years
LCIA Method and Version:	TRACI 2.1
This life cycle assessment was independently verified in accordance with ISO 14044:2006/AMD 1:2007/AMD 2:2020 and the reference PCR by:	☐ internal ☒ external Lindita Bushi Lindita Bushi, Ph.D., Athena Sustainable Materials Institute
ISO 21930:2017 serves as the core PCR. Sub-category PCR: NSF Seating Product Category Rule:	NSF Product Category Rule for Environmental Product Declarations. NSF 1103-25. BIFMA PCR for Seating: UNCPC 3811 – Version 4. NSF International. Valid through January 31, 2030.
Part A PCR Review conducted by:	BIFMA PCR working group
The sub-category PCR review was conducted by:	Industrial Ecology Consultants, Thomas P. Gloria, PhD, t.gloria@industrial-ecology.com
This declaration was independently verified in accordance with ISO 14025: 2006. ISO 21930:2017 serves as the core PCR. Sub-category PCR: NSF Seating Product Category Rule:	☐ internal ☒ external Lindita Bushi Lindita Bushi, Ph.D., Athena Sustainable Materials Institute

Disclaimers: *This EPD conforms to ISO 14025, 14040 and 14044.*

The PCR this EPD was based on was written to determine the potential environmental impacts of a seating furniture product from cradle-to-gate with options. It was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works. The owner of the declaration shall be liable for the underlying information and evidence; SCS shall not be liable with respect to manufacturer information, life cycle assessment data, and evidence supplied or made available to SCS.

Table of Contents

1. KEILHAUER 2
2. Product 2
3. LCA: Calculation Rules 6
4. LCA: Scenarios and Additional Technical Information 11
5. LCA: Results 13
6. LCA: Interpretation 15
7. Additional Environmental Information 15
8. References 15

1. KEILHAUER

Keilhauer thoughtfully manufactures seating and tables for all the different ways people work. Keilhauer products are made to support engaging communications in offices, lobbies, lunchrooms and more. Working with world-renowned designers, Keilhauer is internationally recognized for award-winning design, built with a craftsmanship that is held to the highest environmental standards.

2. Product

2.1 PRODUCT DESCRIPTION

Table 1. *Keilhauer products included in the EPD scope.*

Product Line	SKU	Sub-Category	Product mass (kg)	Product Description
Symm	93320	Lounge chair (multiple occupants)	44.5 kg	Bench with magic angled corner and aluminum base.

2.2 PRODUCT FLOW DIAGRAM

A flow diagram illustrating the production processes and life cycle phases included in the scope of the EPD is presented in Figure 1.

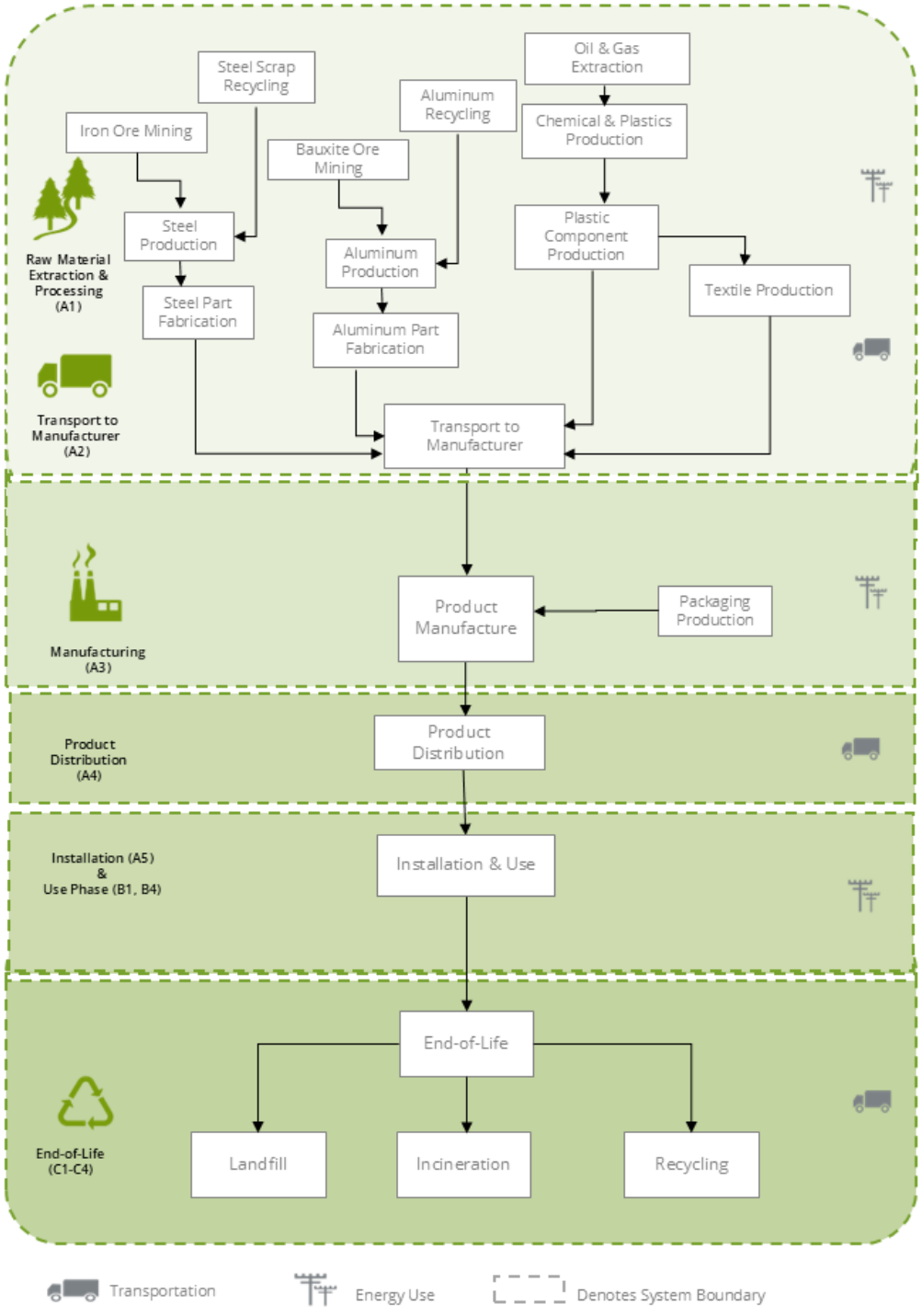

Figure 1. *Flow diagram for the life cycle of the Symm seating product.*

2.3 APPLICATION

The Keilhauer seating products (UNCPC Class 3811, Subclass 38119 - Other seats) provide the primary function of office seating. The products are used in a variety of office settings.

2.4 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is Cradle-to-gate with options (A1-A5, B1, B4 and C1-C4), including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. The life cycle phases included in the product system boundary are shown below.

Cut-off and allocation procedures are described below and conform to the PCR and ISO standards.

Table 2. *Life cycle phases included in the product system boundary.*

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
x	x	x	x	x	x	MND	MND	x	MND	MND	MND	x	x	x	x	MND

X = Included in system boundary
MND = Module not declared

2.5 TECHNICAL DATA

Specifications for the Keilhauer seating products can be found on the manufacturer's website https://www.keilhauer.com/.

2.6 MARKET PLACEMENT/APPLICATION RULES

The products are distributed to consumer markets throughout North America. Detailed product performance results can be found on the manufacturer's website https://www.keilhauer.com/.

2.7 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The products are delivered assembled and wrapped in plastic and reusable furniture pads.

2.8 MATERIAL COMPOSITION

The products are made primarily from wood, fabricated steel and aluminum components and various plastics and hardware. No electrical components are used in the products.

Table 3. *Material content for the products in kg per functional unit and as a percentage of total mass.*

Component	Mass	Percent of total	Pre-consumer		Post-consumer	
	kg	%	kg	%	kg	%
Steel	0.336	1%	$3.17x10^{-2}$	9%	$1.97x10^{-2}$	6%
Aluminum	10.3	23%	3.07	30%	0.793	8%
Plastic	$1.00x10^{-2}$	0%	0.00	0%	0.00	0%
Fabric	3.32	7%	0.00	0%	0.00	0%
Zinc	$4.72x10^{-2}$	0%	0.00	0%	0.00	0%
Wood	30.6	69%	19.8	65%	0.00	0%
Total	**44.5**	**100%**	**23.0**	**52%**	**0.813**	**2%**

Based on a review of the product components provided by the manufacturer, no regulated chemicals, i.e., substances of Very High Concern (SVHC) or substances on the REACH Candidate List, were identified in the product or product components.

2.9 MANUFACTURING

The products are manufactured at the Keilhauer production facility in Ontario, Canada. The manufacturer provided primary data for their annual production, resource use and electricity consumption and waste generation at the facility. Electricity consumption is modeled using modified Ecoinvent datasets for the regional electricity grid for Ontario and is accounted for in the A3 stage of the life cycle.

2.10 PACKAGING

The products are packaged with plastic wrap and reusable furniture pads.

Table 4. *Material content for the product packaging in kg per functional unit.*

Component	Mass	Percent of total	Pre-consumer		Post-consumer	
	kg	%	kg	%	kg	%
Plastic	0.220	3%	0.00	0.00	0.00	0.00
Cardboard	6.35	97%				
Paper	$1.36x10^{-3}$	0%				
Foam	0.00	0%				
Total	**6.57**	**100%**				

2.11 PRODUCT INSTALLATION

Installation of the product is accomplished using hand tools with negligible impacts. Following PCR guidance, 0.625 kWh of electricity is consumed during installation of the product. The impacts associated with packaging disposal are also included with the installation phase as per PCR requirements.

2.12 USE CONDITIONS

No special conditions of use are noted.

2.13 REFERENCE SERVICE LIFE

The Reference Service Life (RSL) of the products is 10 years as specified by the PCR.

2.14 RE-USE PHASE

The products are not reused at end-of-life.

2.15 DISPOSAL

End-of-life assumptions are based on waste disposal statistics for the United States.

2.16 FURTHER INFORMATION

Further information on the product can be found on the manufacturer's website https://www.keilhauer.com/.

3. LCA: Calculation Rules

3.1 FUNCTIONAL UNIT

The Keilhauer seating products serve the function of office seating. According to ISO 14044, the functional unit is "the quantified performance of a product system, for use as a reference unit. The functional unit used in the study, as specified in the PCR, is one complete product serving the specified function for a 10-year period. The reference flow for the product system is one complete product, excluding packaging, with mass as summarized in Table 5.

Table 5. *Reference flow and RSL for the seating products.*

Product Name	Functional Unit	Reference Flow	Reference Service Life – RSL (years)	Total # of Products Modeled
Symm	One unit of seating to seat two (2) occupants, maintained for 10 years	44.5 kg	10	1

3.2 SYSTEM BOUNDARY

The scope of the EPD is Cradle-to-gate with options (A1-A5, B1, B4 and C1-C4), including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. The life cycle phases included in the EPD scope are described in Table 6.

Table 6. *The modules and unit processes included in the scope for the product system.*

Module	Module description from the PCR	Unit Processes Included in Scope
A1	Extraction and processing of raw materials; any reuse of products or materials from previous product systems; processing of secondary materials; generation of electricity from primary energy resources; energy, or other recovery processes from secondary fuels	Extraction and processing of raw materials for the wall system components.
A2	Transport (to the manufacturer)	Transport of component materials to the manufacturing facilities.
A3	Manufacturing, including ancillary material production	Manufacturing of the products and packaging (including upstream unit processes).
A4	Transport (to the building site)	Transport of product (including packaging) to the building site.
A5	Construction-installation process	Electricity consumption required for product installation is included in this phase following PCR guidance. Impacts from packaging disposal are also included in this phase.
B1	Product use	There are no impacts from the use of the seating products in a commercial building setting.
B2	Product maintenance	Module Not Declared
B3	Product repair	Module Not Declared
B4	Product replacement	No replacement of the products is required over the 10-year ESL of the assessment.
B5	Product refurbishment	Module Not Declared
B6	Operational energy use by technical building systems	Module Not Declared
B7	Operational water uses by technical building systems	Module Not Declared
C1	Deconstruction, demolition	Demolition of the product is accomplished using hand tools with no associated emissions and negligible impacts.
C2	Transport (to waste processing)	Transport of the product to waste treatment at end-of-life.

Module	Module description from the PCR	Unit Processes Included in Scope
C3	Waste processing for reuse, recovery and/or recycling	The products are disposed of by landfilling or incineration which require no waste processing.
C4	Disposal	Disposal of the product in a municipal landfill, incineration or recycling.
D	Reuse-recovery-recycling potential	Module Not Declared

3.3 PRODUCT SPECIFIC CALCULATION FOR USE PHASE

There are no impacts associated with the use of the products. It is assumed any impacts associated with routine cleaning and maintenance are negligible over the product life cycle. Impacts related to indoor air quality during the product use phase are also negligible.

3.4 UNITS

All data and results are presented using SI units.

3.5 ESTIMATES AND ASSUMPTIONS

- The Keilhauer facilities are located in Toronto, Ontario. Electricity use at the manufacturing facilities was modeled using Ecoinvent inventory datasets for the regional electricity grid mix for Ontario, Canada.
- Electricity and resource use at the production facilities were allocated to the products based on product mass utilizing annual production data for June 2023 through May 2024 provided by the manufacturer.
- Primary data for upstream component fabrication were not available. Representative LCI datasets from the Ecoinvent database were used to model processing for steel, aluminum and plastic material components.
- For end-of-life, disposal of the product and product packaging is modeled based on 2018 statistics for municipal solid waste generation and disposal in the United States, from the US Environmental Protection Agency. These data provide recycling rate estimates for household and municipal waste, durable and non-durable goods, as well as for packaging and containers.
- For final disposal of the product and packaging materials at end-of-life, all materials are assumed to be transported 20 miles (~32 km) by diesel truck to either a landfill, incineration facility, or material reclamation facility (for recycling). Datasets representing disposal in a landfill and waste incineration are from Ecoinvent.
- Modeling of recycled materials follows the recycled content method (also known as 100-0 method or cut-off method) whereby only the burdens of reprocessing the waste material are allocated to the system from the use of the recycled material.

The PCR requires the results for several inventory flows related to construction products to be reported including energy and resource use and waste and outflows. These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted taking into account this limitation.

3.6 CUT-OFF RULES

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No known flows are deliberately excluded from this EPD.

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3.7 DATA SOURCES

Primary data were provided for the manufacturing facility. The sources of secondary LCI data are the Ecoinvent database.

Table 7. *Data sources for the Keilhauer products.*

Component	Dataset	Data Source	Publication Date
PRODUCT			
Wood	market for medium density fibreboard | medium density fibreboard | Cutoff, U - RoW	EI v3.12	2025
	plywood production | plywood | Cutoff, U - CA-QC	EI v3.12	2025
Steel	market for metal working, average for steel product manufacturing | metal working, average for steel product manufacturing | Cutoff, U - GLO	EI v3.12	2025
	steel production, converter, low-alloyed | steel, low-alloyed | Cutoff, U - RoW	EI v3.12	2025
	steel production, electric, low-alloyed | steel, low-alloyed | Cutoff, U - CA-QC	EI v3.12	2025
Aluminum	market for aluminium, cast alloy | aluminium, cast alloy | Cutoff, U - GLO	EI v3.12	2025
	market for metal working, average for aluminium product manufacturing | metal working, average for aluminium product manufacturing | Cutoff, U - GLO	EI v3.12	2025
	aluminium production, primary, ingot | aluminium, primary, ingot | Cutoff, U - CA	EI v3.12	2025
Nylon	market for nylon 6 | nylon 6 | Cutoff, U - RoW	EI v3.12	2025
Polyester	market for textile, nonwoven polyester | textile, nonwoven polyester | Cutoff, U - GLO	EI v3.12	2025
Polypropylene	market for textile, nonwoven polypropylene | textile, nonwoven polypropylene | Cutoff, U - GLO	EI v3.12	2025
Plastic film	market for packaging film, low density polyethylene | packaging film, low density polyethylene | Cutoff, U - GLO	EI v3.12	2025
Plastics and Polymers	polyethylene production, high density, granulate | polyethylene, high density, granulate | Cutoff, U - RoW	EI v3.12	2025
	market for polychloroprene | polychloroprene | Cutoff, U - GLO	EI v3.12	2025
	market for polyester resin, unsaturated | polyester resin, unsaturated | Cutoff, U - RoW	EI v3.12	2025
	market for butadiene | butadiene | Cutoff, U - CA	EI v3.12	2025
Brass	market for brass | brass | Cutoff, U - RoW	EI v3.12	2025
Zinc	market for zinc | zinc | Cutoff, U - GLO	EI v3.12	2025
Electric Components	market for plug, inlet and outlet, for computer cable | plug, inlet and outlet, for computer cable | Cutoff, U - GLO	EI v3.12	2025
Rigid Foam	market for polyurethane, rigid foam | polyurethane, rigid foam | Cutoff, U - RER	EI v3.12	2025
Flexible Foam	market for polyurethane, flexible foam | polyurethane, flexible foam | Cutoff, U - RoW	EI v3.12	2025
Rubber	market for synthetic rubber | synthetic rubber | Cutoff, U - GLO	EI v3.12	2025
PACKAGING			
Cardboard	market for corrugated board box | corrugated board box | Cutoff, U - CA-QC	EI v3.12	2025
Plastic film	market for packaging film, low density polyethylene | packaging film, low density polyethylene | Cutoff, U - GLO	EI v3.12	2025
Paper	market for printed paper | printed paper | Cutoff, U - GLO	EI v3.12	2025
TRANSPORT			
Diesel truck	transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, S/RoW	EI v3.12	2025
Ocean shipping	market for transport, freight, sea, container ship, heavy fuel oil | transport, freight, sea, container ship, heavy fuel oil | Cutoff, U - GLO	EI v3.12	2025

Component	Dataset	Data Source	Publication Date
RESOURCES			
Grid electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, S/CA-ON	EI v3.12	2025
Heat - natural gas	market for heat, district or industrial, natural gas | heat, district or industrial, natural gas | Cutoff, U - CA-QC	EI v3.12	2025
WASTE DISPOSAL			
Landfill	treatment of municipal solid waste, sanitary landfill | municipal solid waste | Cutoff, U - CA-QC	EI v3.12	2025
Incineration	treatment of municipal solid waste, municipal incineration | municipal solid waste | Cutoff, U - CA	EI v3.12	2025

[1] The Ecoinvent transportation datasets used in the assessment include empty backhauls.

3.8 DATA QUALITY

The data quality assessment addressed the following parameters: time-related coverage, geographical coverage, technological coverage, precision, completeness, representativeness, consistency, reproducibility, sources of data, and uncertainty.

Table 8. *Data quality assessment for the product system.*

Data Quality Parameter	Data Quality Indicator (DQI)[1]	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	2	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 5 years old. All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on annual production for 2023-24.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	2	The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative data for the US. Surrogate data used in the assessment are representative of global or European operations. Data representative of European operations are considered sufficiently similar to actual processes. Data representing product disposal are based on regional statistics for the US.
Technology Coverage: Specific technology or technology mix	1	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative fabrication datasets, specific to the type of material, are used to represent the actual processes, as appropriate.
Precision: Measure of the variability of the data values for each data expressed	3	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	1	The LCA model included all known mass and energy flows for production of the products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	2	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied	1	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent v3.11 data where available. Different portions of the product life cycle are equally considered.

Data Quality Parameter	Data Quality Indicator (DQI)[1]	Data Quality Discussion
uniformly to the various components of the analysis		
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	1	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	2	Data representing energy use at the manufacturing facilities represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI data, Ecoinvent v3.11 LCI data are used.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	3	Uncertainty related to materials in the products and packaging is low. Actual supplier data for upstream operations were not available and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

[1] Data quality indicators (DQIs) are based on guidance from the BIFMA PCR for Seating: UNCPC 3811 – Version 4. (1=Very Good, 2= Good, 3= Fair, 4= Poor and 5= Very Poor)

3.9 PERIOD UNDER REVIEW

The period of review is 2023-24.

3.10 ALLOCATION

Manufacturing resource use was allocated to the products based on mass. Impacts from transportation were attributed to the product based on the mass of material and distance transported.

3.11 COMPARABILITY

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

4. LCA: Scenarios and Additional Technical Information

Delivery and Installation stage (A4 - A5)

Distribution of the products to the point of installation is included in the assessment based on information provided by the manufacturer. Transportation parameters for modeling transport to consumer markets in North America are summarized in Table 9.

Table 9. *Product distribution parameters by transport mode and distance per functional unit.*

Parameter	Unit	Value
Fuel type	-	Diesel
Liters of fuel	L/100km	18.7
Vehicle type	-	Diesel truck
Capacity utilization	%	76
Transport distance	km	2,000
Gross mass transported[1]	kg	51.1

[1] Including packaging

Installation of the product is accomplished using hand tools with no associated emissions and negligible impacts. Electricity consumption associated with installation of the product is based on PCR requirements. The impacts associated with packaging disposal are included with the installation phase as per PCR requirements. The relevant recycling rates applied to the assessment are summarized in Table 10. The modeling parameters used for installation are summarized in Table 11.

Table 10. *Recycling rates for packaging materials at end-of-life.*

Material	Recycling rate (%)	Landfill rate (%)	Incineration rate (%)
Recycling Rates			
Paper and Cardboard	47.40%	42.30%	10.30%
Plastics and Foam	2.40%	78.60%	19.00%

Table 11. *Installation parameters for the products per functional unit.*

Parameter		Value
Ancillary materials		-
Net freshwater consumption (m^3)		-
Electricity consumption (kWh)		0.625
Product loss per functional unit (kg)		negligible
Waste materials generated by product installation (kg)		negligible
Output materials resulting from on-site waste processing (kg)		n/a
Mass of packaging waste (kg)	Plastic	0.220
	Cardboard	6.35
	Paper	$1.36x10^{-3}$
	Foam	0.00
Biogenic carbon contained in packaging (kg CO_2)		11.7
Direct emissions (kg)		-

Use stage (B1)

No impacts are associated with the use of the product over the Reference Service Lifetime.

Replacement stage (B4)

No product replacements are required over the 10 year lifetime of the product.

Disposal stage (C1 - C4)

No specific data are available regarding the recycling rate of materials of the products at end-of-life. Assumptions for end-of-life are based on statistics regarding municipal solid waste generation and disposal in the United States. The relevant recycling rates applied to the assessment are summarized in Table 12 while the disposal modeling parameters are presented in Table 13.

Table 12. *Recycling rates for product and packaging materials at end-of-life.*

Material	Product Recycling rate (%)
Recycling Rates	
Steel	27.8%
Plastic	6.8%
Disposal of Non-recyclables	
Landfill	80.0%
Incineration	20.0%

Table 13. *End-of-life disposal scenario parameters for the seating products per functional unit.*

Parameter	Value
Assumptions for scenario development	US EPA Waste Statistics
Collection processes (kg)	
Collected with mixed construction waste (kg)	44.5
Recovery	n/a
Recycling (kg)	0.09
Landfill disposal (kg)	36.6
Incineration (kg)	7.83
Removals of biogenic carbon (kg CO_2 eq)[1]	n/a

[1] Excluding packaging materials.

Transportation of the products at end of life assumes a 20 mile average distance to disposal, consistent with assumptions used in the US EPA WARM model.

5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. These indicator results are based on characterization methods that still need development and the use of the indicator result is therefore limited.

Category indicator results for the product are summarized by life cycle phase in Table 14 and Table 15. All LCA results are stated to three significant figures in agreement with the PCR for this product and therefore the sum of the total values may not exactly equal 100%.

Table 14. *Life Cycle Impact Assessment (LCIA) results for the Keilhauer seating products per functional unit. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits*.

Impact Category	A1-A3	A4	A5	B1	B4	C1	C2	C3	C4
TRACI 2.1									
Global warming potential (kg CO_2 eq)	162	20.2	1.76	0.00	0.00	0.00	0.281	0.00	20.5
	79%	10%	1%	0%	0%	0%	0%	0%	10%
Acidification potential (kg SO_2 eq)	0.914	$7.86x10^{-2}$	$9.00x10^{-4}$	0.00	0.00	0.00	$1.10x10^{-3}$	0.00	$7.68x10^{-3}$
	91%	8%	0%	0%	0%	0%	0%	0%	1%
Eutrophication potential (kg N eq)	1.30	$3.25x10^{-2}$	$6.09x10^{-2}$	0.00	0.00	0.00	$4.50x10^{-4}$	0.00	0.777
	60%	1%	3%	0%	0%	0%	0%	0%	36%
Smog formation potential (kg O_3 eq)	12.5	1.96	$1.79x10^{-2}$	0.00	0.00	0.00	$2.74x10^{-2}$	0.00	0.142
	85%	13%	0%	0%	0%	0%	0%	0%	1%
Ozone depletion potential (kg CFC11 eq)	$4.88x10^{-5}$	$3.13x10^{-7}$	$2.74x10^{-9}$	0.00	0.00	0.00	$4.37x10^{-9}$	0.00	$1.47x10^{-8}$
	99%	1%	0%	0%	0%	0%	0%	0%	0%
Abiotic depletion potential for fossil resources (MJ, LHV)	1,260	71.4	3.95	0.00	0.00	0.00	7.53	0.00	3.98
	94%	5%	0%	0%	0%	0%	1%	0%	0%
IPCC									
2021 IPCC AR6 GWP (kg CO_2 eq)	88.8	20.5	3.08	0.00	0.00	0.00	0.285	0.00	36.6
	60%	14%	2%	0%	0%	0%	0%	0%	25%
Climate change - Fossil (kg CO_2 eq)	160	20.4	0.608	0.00	0.00	0.00	0.285	0.00	5.77
	86%	11%	0%	0%	0%	0%	0%	0%	3%
Climate change - Biogenic (kg CO_2 eq)	83.6	0.118	2.47	0.00	0.00	0.00	$1.64x10^{-3}$	0.00	30.8
	71%	0%	2%	0%	0%	0%	0%	0%	26%
Climate change - CO_2 uptake (kg CO_2 eq)	-157	-0.113	$-2.90x10^{-3}$	0.00	0.00	0.00	$-1.57x10^{-3}$	0.00	$-7.21x10^{-3}$
	100%	0%	0%	0%	0%	0%	0%	0%	0%
Climate change - Land use (kg CO_2 eq)	1.98	$9.11x10^{-3}$	$6.06x10^{-3}$	0.00	0.00	0.00	$1.30x10^{-4}$	0.00	$2.33x10^{-3}$
	99%	0%	0%	0%	0%	0%	0%	0%	0%

Table 15. *Resource use and waste flows for the seating products per functional unit. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Parameter	A1-A3	A4	A5	B1	B4	C1	C2	C3	C4
Resources									
Primary Energy Demand. Total (MJ)	5,130	286	8.78	0.00	0.00	0.00	3.99	0.00	13.6
	94%	5%	0%	0%	0%	0%	0%	0%	0%
Use of renewable primary energy (MJ)	2,280	3.97	0.987	0.00	0.00	0.00	$5.53x10^{-2}$	0.00	0.811
	100%	0%	0%	0%	0%	0%	0%	0%	0%
Use of renewable primary energy resources used as raw materials (MJ)	664	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	100%	0%	0%	0%	0%	0%	0%	0%	0%
Use of nonrenewable primary energy (MJ)	2,090	282	7.79	0.00	0.00	0.00	3.93	0.00	12.8
	87%	12%	0%	0%	0%	0%	0%	0%	1%
Use of nonrenewable primary energy resources used as raw materials (MJ)	95.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	100%	0%	0%	0%	0%	0%	0%	0%	0%
Use of secondary materials (kg)	23.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	100%	0%	0%	0%	0%	0%	0%	0%	0%
Resource | Use of renewable secondary fuels (MJ)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Resource | Use of nonrenewable secondary fuels (MJ)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Recovered energy (MJ)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Use of net fresh water (m^3)[1]	4.51	$3.87x10^{-2}$	$9.04x10^{-3}$	0.00	0.00	0.00	$5.40x10^{-4}$	0.00	-0.101
	101%	1%	0%	0%	0%	0%	0%	0%	-2%
Wastes									
Hazardous waste (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0%	0%	0%	0%	0%	0%	0%	0%	0%
Nonhazardous waste (kg)	0.549	0.00	3.56	0.00	0.00	0.00	0.00	0.00	44.5
	1%	0%	7%	0%	0%	0%	0%	0%	92%
High-level radioactive waste (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Low-level Radioactive waste (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Components for re-use (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Materials for recycling (kg)	3.32	0.00	3.02	0.00	0.00	0.00	0.00	0.00	$9.42x10^{-2}$
	52%	0%	47%	0%	0%	0%	0%	0%	1%
Materials for energy recovery (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported energy (MJ)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

[1] Reported water consumption does not include water usage from electricity generation.

6. LCA: Interpretation

The contributions to total indicator impacts are dominated by the *Raw Materials Processing* stage which accounts for a majority of the total potential impacts, depending on the specific product and impact indicator. With the exception of the Eutrophication potential indicator, the *Distribution* and *Manufacturing* stages are the next highest contributors to total potential impacts followed by the *Disposal* stage. For the Eutrophication potential indicator, the product *Disposal* stage dominates the overall impacts, due primarily to landfilling of the wood and plastic product components.

7. Additional Environmental Information

This product is part of Keilhauer's Carbon Neutral collection. Keilhauer is committed to reducing emissions at every stage of our process from thoughtful design and material selection to responsible production, distribution, and end-of-life considerations. We also address emissions by supporting third-party verified carbon offset projects. The following projects are currently or have previously been supported by Keilhauer.

(1) Big Coast Forest Climate Initiative (BC, Canada)

This Verra-certified project defers harvesting 100,000 acres of private land for 25+ years, preserving ecosystems, watersheds, and culturally significant lands. A portion of revenue supports Indigenous initiatives and the Pacific Salmon Foundation.

(2) Ascend N2O Abatement (Florida, USA)

This CAR-registered project eliminates over 98% of N2O emissions, a GHG 273x worse than CO_2, tied to Nylon production. It is the largest voluntary N2O abatement project in North America.

For more carbon neutral information regarding *Symm* seating, please visit https://www.keilhauer.com/.

8. References

- Life Cycle Assessment of Keilhauer Seating Products. SCS Global Services Report. Prepared for client. September 2025. Updated June 2026.
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
- ISO 14040:2006/Amd 1:2020 Environmental Management – Life cycle assessment – Principles and Framework
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- SCS Type III Environmental Declaration Program: Program Operator Manual. V12.0 December 2023. SCS Global Services.
- NSF Product Category Rule for Environmental Product Declarations. NSF 1103-25. BIFMA PCR for Seating: UNCPC 3811 – Version 4. NSF International. Valid through January 31, 2030.
- Ecoinvent Centre (2025) ecoinvent data from v3.12. Swiss Center for Life Cycle Inventories, Dübendorf, 2025, http://www.ecoinvent.org
- European Joint Research Commission. International Reference Life Cycle Data System handbook. General guide for Life Cycle Assessment – Detailed Guidance. © European Union, 2010.

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