Furnishing Knowledge®

VERIFIED by SCS GLOBAL SERVICES
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner

KI
1330 Bellevue Street,
Green Bay, WI
800.424.2432 | www.ki.com | info@ki.cm

Products

Tattoo Panel System

Functional Unit

The functional unit is one square meter of the Tattoo Panel System product maintained for 10 years.

EPD Number and Period of Validity

SCS-EPD-06847
EPD Valid April 6, 2021 through April 5, 2026

Product Category Rule

Product Category Rule for Environmental Product Declarations
BIFMA PCR for Office Furniture Workspace Products: UNCPC 3814.

Program Operator

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608
+1.510.452.8000 | www.SCSglobalServices.com

SCSglobal SERVICES

Declaration Owner:	KI
Address:	1330 Bellevue Street, Green Bay, WI
Declaration Number:	SCS-EPD-06847
Declaration Validity Period:	Valid April 6, 2021 through April 5, 2026
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
Product:	Tattoo Panel System
LCA Practitioner:	Gerard Mansell, PhD., SCS Global Services
LCA Software:	& ecoinvent v3.7
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
Product Category Rule:	Product Category Rule for Environmental Product Declarations BIFMA PCR for Office Furniture Workspace Products: UNCPC 3814.
PCR Review conducted by:	Thomas Gloria Ph.D., Industrial Ecology Consultants
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
Declaration Contents:	

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

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.*

About KI

Since 1941, we've positioned KI as the furniture company that best understands the contract furniture industry and is committed to providing customers with the smart solutions. Our contract furniture innovations reflect a desire to be our customers' market resource and to help them make smart contract furniture decisions. KI manufactures innovative furniture and movable pod system solutions for educational, university, business and government markets. KI continues to differentiate itself and establish enduring relationships throughout the world by personalizing products and service solutions to the specific needs of each customer through its unique design and "Market of One" manufacturing philosophy.

Product Specifications

Tattoo offers a dynamic solution to shifts in business. No need to draw new floor plans, order parts or schedule installation. Elements are easy to arrange and rearrange as roles and responsibilities evolve. Outside of major change, team members have exceptional flexibility to configure their workspace any way they want. Greater workplace responsiveness also improves employee well-being and supports recruitment, retention and productivity. All-around win.

KI's Tattoo panel system products are manufactured at the company's production facility in Manitowoc, Wisconsin. The products are constructed from a variety of materials including steel, aluminum, glass fiberboard, plastics, textiles and coatings sourced from various suppliers. The Tattoo panel products are intended for interior applications including commercial office environments, education, healthcare, hospitality, convention facilities, and multi-purpose spaces providing the primary function of partitioning interior spaces.

Key Environmental Parameters

Table 1. *Key Environmental Parameters, over the life cycle of the Tattoo panel system products per functional unit.*

Parameter	Tattoo w/ Adjustable Base	Tattoo w/ Flat/Bridge Base
Global Warming Potential	98.2 kg CO_2 eq	99.8 kg CO_2 eq
Primary Energy Demand	1,130 MJ	1,120 MJ
Recycled content	72%	67%

Product Material Composition

The primary materials include steel, aluminum, glass fiberboard, plastics, textiles and coatings sourced from various suppliers. Packaging materials consist of plastic, corrugated board and wood pallets.

Table 2. *Material content for the packaging of the Tattoo panel products in kg per square meter and percent of total mass.*

Material	Tattoo w/ Adjustable Base		Tattoo w/ Flat/Bridge Base	
	kg/m²	%	kg/m²	%
Paper	0.00	0%	0.00	0%
Plastic	$2.16x10^{-2}$	0.46%	$2.16x10^{-2}$	0.46%
Pulp	0.199	4.2%	0.199	4.2%
Wood	4.53	95%	4.53	95%
Total Packaging	**4.75**	**100%**	**4.75**	**100%**

Table 3. *Material content for the Tattoo panel products in kg per square meter and percent of total mass.*

Material	Tattoo w/ Adjustable Base		Tattoo w/ Flat/Bridge Base	
	kg/m²	%	kg/m²	%
Steel	0.416	2.4%	2.26	12%
Aluminum	6.90	40%	5.87	32%
Fiberglass	7.81	45%	7.81	43%
Textile	1.74	10%	1.74	9.6%
Plastics	$4.78x10^{-2}$	0.28%	$4.78x10^{-2}$	0.26%
Other	0.438	2.5%	0.438	2.4%
Total Product	**17.4**	**100%**	**18.2**	**100%**

Life Cycle Assessment Overview

System Boundary

The scope of the EPD is cradle-to-grave, 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 below and illustrated in Figure 1.

- *Raw Materials Processing (Sourcing/Extraction)* – This stage includes extraction of virgin materials and reclamation of non-virgin feedstock. Resource use and emissions associated with both extraction of the raw materials and product component manufacturing are included. The impacts associated with transport of the product component materials to the manufacturing facilities are also included in this stage.
- *Manufacturing* – This stage includes all the relevant manufacturing processes and flows, including the impacts from energy use and emissions at the fabrication facilities. Production of capital goods, infrastructure, manufacturing equipment, and personnel-related activities are not included. This stage also includes the production of the product packaging materials. The products are manufactured at the KI facility in Wisconsin utilizing primary data for annual production, resource use and electricity consumption and waste generation.
- *Distribution, Installation and Use* – This stage includes delivery of the product to the point of installation (downstream transportation), and installation and use of the products. A production weighted average transportation distance to the installation site of 1,000 miles was used. The impacts associated with packaging disposal are also included with the installation phase as per PCR requirements. Impacts associated with the installation and use of the products are negligible.
- *Disposal stage* – The end of life stage includes demolition of the products, transport of the products to waste treatment facilities, waste processing and associated emissions as the product degrades in a landfill or is burned in an incinerator. Assumptions for the product and packaging end-of-life are based on the US EPA's disposal statistics for municipal solid waste (MSW) for 2018. Transportation for end-of-life scenarios was modeled using the EPA WARM model assumption of 20 miles (~32 km), from the point of product use to a landfill, material recovery center, or waste incinerator.

Product Life Cycle Flow Diagram

A flow diagram of the product system, including system boundaries, is provided in Figure 1.

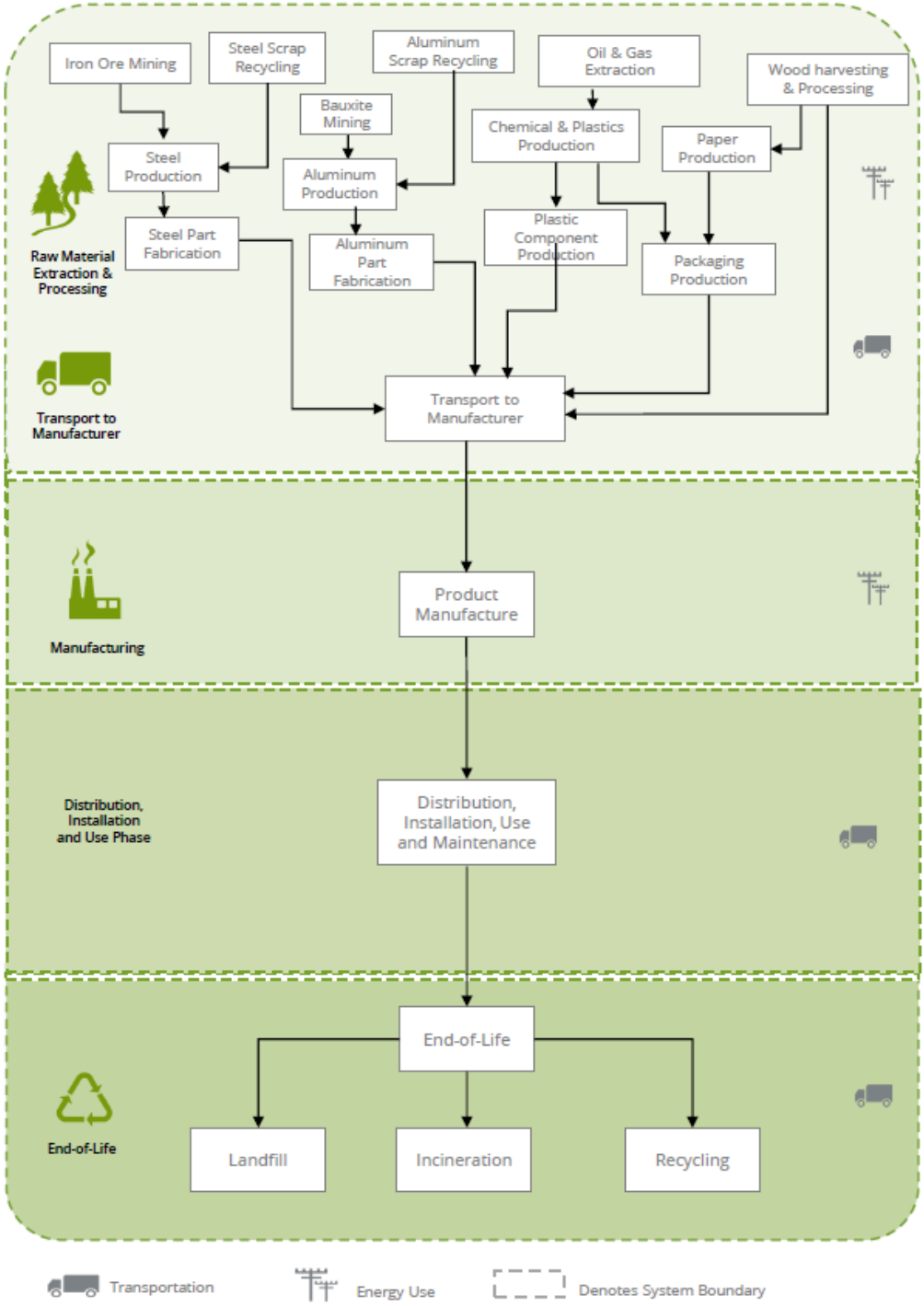

Figure 1. *Flow diagram representing the major unit operations in the life cycle of the Tattoo panel system products.*

Life Cycle Inventory and Environmental Parameters

The resource use and emissions from each step of the product life cycle are summed to obtain the life cycle inventory results. Tables 4 and 5 summarize the results for additional parameters (energy and waste flows) as specified in the PCR. The LCIA and inventory flow results were calculated using the OpenLCA model and summarized for the functional unit from cradle-to-grave. Where necessary, the lower heating value is used for energy flow calculations

Table 4. *Resource use and waste flows for one (1) square meter of the KI Tattoo w/ Flat/Bridge Base panel system products over a 10-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Parameter	Total	Raw Material Extraction & Processing	Manufacturing	Distribution	Disposal
Primary Energy Demand(MJ)	1,130	783	225	110	13.3
	100%	69%	20%	9.7%	1.2%
Renewable primary energy (MJ)	258	123	134	1.28	0.186
	100%	47%	52%	0.5%	0.072%
Non-renewable primary energy (MJ)	873	660	90.7	109	13.1
	100%	76%	10%	12%	1.5%
Water consumption (kg)	4,270	3,580	586	81.5	16.9
	100%	84%	14%	1.9%	0.4%

Table 5. *Resource use flows for one (1) square meter of the KI Tattoo w/ Adjustable Base panel system products over a 10-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Parameter	Total	Raw Material Extraction & Processing	Manufacturing	Distribution	Disposal
Primary Energy Demand(MJ)	1,120	774	225	106	12.7
	100%	69%	20%	9.5%	1.1%
Renewable primary energy (MJ)	266	130	134	1.24	0.183
	100%	49%	50%	0.47%	0.069%
Non-renewable primary energy (MJ)	852	644	90.7	105	12.5
	100%	76%	11%	12%	1.5%
Water consumption (kg)	4,240	3,560	586	78.7	16.6
	100%	84%	14%	1.9%	0.39%

Life Cycle Impact Assessment

The LCA conforms to ISO 14040/44 and the PCR. The following impact indicators, specified by the PCR, are reported below:

TRACI 2.1 Impact Category	Unit
Global Warming Potential (GWP)	kg CO_2 eq
Ozone Depletion Potential (ODP)	kg CFC 11 eq
Acidification Potential (AP)	kg SO_2 eq
Eutrophication Potential (EP)	kg N eq
Smog Formation Potential (SFP)	kg O_3 eq
Fossil Fuel Depletion Potential (ADP_{fossil})	MJ Surplus, LHV

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.

Table 6. *Life Cycle Impact Assessment (LCIA) results for one (1) square meter of the KI Tattoo w/ Adjustable Base panel system products over a 10-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Impact Category	Total	Raw Material Extraction & Processing	Manufacturing	Distribution	Disposal
Global Warming Potential (kg CO_2 eq)	98.2	74.0	10.7	7.72	5.79
	100%	75%	11%	7.9%	5.9%
Acidification Potential (kg SO_2 eq)	0.558	0.445	$7.13x10^{-2}$	$3.43x10^{-2}$	$6.84x10^{-3}$
	100%	80%	13%	6.2%	1.2%
Eutrophication Potential (kg N eq)	0.374	0.232	$5.05x10^{-2}$	$3.54x10^{-2}$	$5.54x10^{-2}$
	100%	62%	14%	9.5%	15%
Smog Formation Potential (kg O_3 eq)	7.21	5.41	0.791	0.837	0.177
	100%	75%	11%	12%	2.5%
Ozone Depletion Potential (kg CFC-11 eq	$7.49x10^{-6}$	$5.12x10^{-6}$	$4.20x10^{-7}$	$1.74x10^{-6}$	$2.11x10^{-7}$
	100%	68%	5.6%	23%	2.8%
Fossil Fuel Depletion Potential (M, surplus)	96.0	69.9	8.34	15.8	1.95
	100%	73%	8.7%	16%	2%

Table 7. *Life Cycle Impact Assessment (LCIA) results for one (1) square meter of the KI Tattoo w/ Flat/Bridge Base panel system products over a 10-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Impact Category	Total	Raw Material Extraction & Processing	Manufacturing	Distribution	Disposal
Global Warming Potential (kg CO_2 eq)	99.8	75.3	10.7	7.98	99.8
	100%	75%	11%	8%	100%
Acidification Potential (kg SO_2 eq)	0.552	0.438	$7.13x10^{-2}$	$3.55x10^{-2}$	0.552
	100%	79%	13%	6.4%	100%
Eutrophication Potential (kg N eq)	0.385	0.243	$5.05x10^{-2}$	$3.57x10^{-2}$	0.385
	100%	63%	13%	9.3%	100%
Smog Formation Potential (kg O_3 eq)	7.32	5.48	0.791	0.866	7.32
	100%	75%	11%	12%	100%
Ozone Depletion Potential (kg CFC-11 eq	$7.71x10^{-6}$	$5.26x10^{-6}$	$4.20x10^{-7}$	$1.80x10^{-6}$	$7.71x10^{-6}$
	100%	68%	5.4%	23%	100%
Fossil Fuel Depletion Potential (M, surplus)	97.9	71.1	8.34	16.4	97.9
	100%	73%	8.5%	17%	100%

Supporting Technical Information

Cut-off criteria

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.

Period under review

The period of review is calendar year 2019.

Allocation

Manufacturing resource use was allocated to the products based on sale price (cost-based allocation). Impacts from transportation were allocated based on the mass of material and distance transported.

The product system includes some recycled materials, which were allocated using the recycled content allocation method (also known as the 100-0 cut-off method). Using the recycled content allocation approach, system inputs with recycled content do not receive any burden from the previous life cycle other than reprocessing of the waste material. At end-of-life, materials which are recycled leave the system boundaries with no additional burden.

Estimates and Assumptions

- The Manitowoc, Wisconsin facility is located in the MROE eGRID EPA NERC sub-region. An Ecoinvent inventory dataset was modified to reflect the eGRID energy mix for MROE to estimate resource use and emissions from electricity use at the facility.
- Electricity and resource use at the production facility were allocated to the Tattoo products based on product sales price utilizing annual revenue data for calendar year 2019 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 aluminum, steel and plastic material components.
- According to the manufacturer, some steel components of the product system contain a significant percentage total recycled content and was assumed to be manufactured using the Electric Arc Furnace (EAF) steel-making route.
- 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 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.

It should also be noted that LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The PCR allows for the results for several inventory flows related to construction products to be reported as “other parameters”. These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted taking into account this limitation.

Background Data

Primary data were provided by KI for the Manitowoc, Wisconsin manufacturing facility. The sources of secondary LCI data are the Ecoinvent database.

Table 8. *Data sources for the Tattoo panel system product.*

Component	Dataset	Data Source	Publication Date
PRODUCT			
Aluminum, pre-consumer recycled	market for aluminium scrap, new | aluminium scrap, new | Cutoff, S/RoW	EI v3.7	2020
Aluminum, post-consumer recycled	market for aluminium scrap, post-consumer | aluminium scrap, post-consumer | Cutoff, S/GLO	EI v3.7	2020
Aluminum, primary	market for aluminium, primary, ingot | aluminium, primary, ingot | Cutoff, S/IAI Area, North America	EI v3.7	2020
Steel - BOF	steel production, converter, low-alloyed | steel, low-alloyed | Cutoff, S/RoW	EI v3.7	2020
Steel - EAF	steel production, electric, low-alloyed | steel, low-alloyed | Cutoff, S/RoW	EI v3.7	2020
Glass fiber board	glass fibre production | glass fibre | Cutoff, S/RoW	EI v3.7	2020
PVC	polyvinylchloride production, bulk polymerisation | polyvinylchloride, bulk polymerised | Cutoff, S/RoW	EI v3.7	2020
Polyurethane	polyurethane production, flexible foam, recycled, 30% pre-consumer | polyurethane, flexible foam | Cutoff, S/RoW	EI v3.7	2020
Polyester fabric	Recycled PET yarn	EI v3.7	2020
Adhesive/Tape	acrylic binder production, product in 34% solution state | acrylic binder, without water, in 34% solution state | Cutoff, S/RoW	EI v3.7	2020
Powder coat	coating powder production | coating powder | Cutoff, S/RoW	EI v3.7	2020
PACKAGING	**PACKAGING**		
Corrugated/Paper	containerboard production, linerboard, kraftliner | containerboard, linerboard | Cutoff, S/RoW; kraft paper production | kraft paper | Cutoff, S/RoW	EI v3.7	2020
Packaging plastic	packaging film production, low density polyethylene | packaging film, low density polyethylene | Cutoff, S/RoW	EI v3.7	2020
Steel	steel production, converter, low-alloyed | steel, low-alloyed | Cutoff, S/RoW	EI v3.7	2020
Wood	EUR-flat pallet production | EUR-flat pallet | Cutoff, S/RoW		
RESOURCES	**RESOURCES**		
Grid electricity	Electricity, medium voltage, per kWh - MROE/MROE	EI v3.7; eGRID	2020; 2018
Natural gas	heat production, natural gas, at boiler modulating >100kW | heat, district or industrial, natural gas | Cutoff, S/RoW	EI v3.7	2020
Fuel oil	heat production, light fuel oil, at industrial furnace 1MW | heat, district or industrial, other than natural gas | Cutoff, S/CA-QC	EI v3.7	2020
Diesel	diesel, burned in building machine | diesel, burned in building machine | Cutoff, S/GLO		
Propane	heat production, propane, at industrial furnace >100kW | heat, district or industrial, other than natural gas | Cutoff, S/RoW	EI v3.7	2020
TRANSPORTATION	**TRANSPORTATION**		
	transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, S/RoW	EI v3.7	2020

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 9. *Data quality assessment for the Tattoo panel product system.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	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 (typically 2016). 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 2019.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	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.
Technology Coverage: Specific technology or technology mix	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	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	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	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 uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent v3.7 data where available. Different portions of the product life cycle are equally considered.
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	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	Data representing energy use at KI's manufacturing facilities represents 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 v3.7 LCI data are used.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	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.

Additional Environmental Information

INDOOR ADVANTAGE GOLD FURNITURE

KI supports a healthy indoor environment through emissions testing. Unite Panel System products are certified Indoor Advantage™ Gold, qualify for LEED low-emitting materials credits, comply with ANSI/BIFMA X7.1/M7.1, and meet CA 01350 air emissions requirements.

References

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For more information, contact:

KI
1330 Bellevue Street,
Green Bay, WI
800.424.2432 | www.ki.com | info@ki.cm

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA
Main +1.510.452.8000 | fax +1.510.452.8001