STANLEY Access Technologies

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner
Allegion Access Technologies LLC
65 Scott Swamp Rd. Farmington, CT 06032
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Product
Magic Access Automatic Swing Operators

(UNSPSC 30171510 – Automatic doors)

Functional Unit
1 square meter of door opening maintained and operated for 10 years.

Scope
The scope of this EPD is Cradle-to-Gate with scenarios

EPD Number and Period of Validity
SCS-EPD-09232
EPD Valid July 18, 2023 through July 17, 2028

Product Category Rule
Product Category Rule for Preparing an Environmental Product Declaration for Power-Operated Pedestrian and Revolving Doors. UNCPC 4212. ASTM International.
PCRExt 2022-114, valid through August 31, 2023

Program Operator
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SCS global SERVICES

Declaration Owner:	Allegion Access Technologies LLC
Address:	65 Scott Swamp Rd. Farmington, CT 06032
Products:	Magic Access Automatic Swing Operators
Declaration Number:	SCS-EPD-09232
Declaration Validity Period:	EPD Valid July 18, 2023 through July 17, 2028
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Gerard Mansell, Ph.D., SCS Global Services
LCA Software and LCI database:	OpenLCA v1.11 software and the Ecoinvent v3.9 database
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Lindita Bushi, Ph.D., Athena Sustainable Materials Institute
Product Category Rule:	Product Category Rule for Preparing an Environmental Product Declaration for Power-Operated Pedestrian and Revolving Doors. UNCPC 4212. ASTM International. PCRExt 2022-114, valid through August 31, 2023
PCR Review conducted by:	
Independent verification of the declaration and data, according to ISO 14025, ISO 21950 and the PCR	☐ internal ☒ external
EPD Verifier:	Lindita Bushi, Ph.D., Athena Sustainable Materials Institute

Declaration Contents:

Disclaimers: *This Environmental Product Declaration (EPD) conforms to ISO 14025, 14040, 14044, and ISO 21930:2017.*

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 STANLEY® Access Technologies

STANLEY® Access Technologies is committed to being an industry leader in door automation through exceptional service, high quality product innovation, and lowest total cost of ownership. For over 80 years, we have been designing, building, installing and servicing manual and automatic sliding, swinging, revolving and folding doors as well as sensors and controls.

Everywhere you go, you can find our trusted products throughout a wide variety of commercial, institutional, industrial and transportation applications.

Headquartered in Farmington, CT, STANLEY® Access Technologies is the largest manufacturer, installer and service provider of automatic doors in North America.

PRODUCT DESCRIPTION

The STANLEY Access Magic Access Automatic Swing Operators are manufactured in an ISO 9001 certified facility in Farmington, Connecticut.

The STANLEY Magic Access is a versatile electromechanical swing door operator that can be used in Low Energy swing door applications where the operator is surface mounted. The controller provides power to the operator and controls all the inputs from activation and safety sensors as well as door functions. The closing speed is controlled by employing the motor as a dynamic break. The closing spring is preloaded for positive closing action so the door will close with or without power. The Magic-Access is UL listed as a fire door operator and can be used in push or pull applications with doors weighing up to 125 lbs.

PRODUCT SPECIFICATION

Table 1. *Product specifications for the STANLEY Magic Access Automatic Swing Operators.*

Parameter	Value
Header Size	6 1/8" (152 mm) High x 4" (102 mm) deep
Swing Door Panels	Up to 42" (1,067 mm)
Door Panel Weight	Up to 125 pounds (57 kg)
Drive System	1/8 HP DC Motor, Gear Drive, "Low-energy"
Controller	Solid State, Electronic, with Built in "Reverse-on-obstruction" Magic-Touch® Activation
Activation Sensor Options	Mats, Motion Detectors, Radio Controls or Touch-less wave sensors
Breakout	Breakaway Door Stop Available
Power Required	120 VAC, 5 Amps Minimum
Codes and Standards	UL, cUL, ANSI/BHMA A156.19, NFPA 101, CSFM

MATERIAL RESOURCES

The material composition and availability of raw material resources of the Magic Access Automatic Swing Operators are shown in Table 2. Information on product packaging is shown in Table 3.

Table 2. *Material composition of* the *STANLEY Access Magic Access Swing Operators.*

Component	Material	Availability				Magic Access	
		Renewable	Non-Renewable	Recycled (% pre-/post-consumer)	Origin of Materials	(kg/m^2)	(%)
Recycled Aluminum	Aluminum		Mineral, Abundant	30%/40%	North America	0.76	9.6%
Aluminum	Aluminum		Mineral, Abundant	0%	Global	4.3	54%
Steel	Steel		Mineral, Abundant	0%	Global	2.6	33%
Plastic	Plastic		Fossil, Limited	0%	Global	3.9×10^{-2}	0.48%
Electronic Components	Steel, Plastic,		Mineral, Abundant	0%	Global	0.25	3.1%
Total						**8.0**	**100%**

Table 3. *Material composition of packaging for the STANLEY Access Magic Access Swing Operators.*

Component	Material	Availability				Magic Access	
		Renewable	Non-Renewable	Recycled (% pre-/post-consumer)	Origin of Materials	(kg/m^2)	(%)
Paper	Paper	Abundant		0%	Global	0.12	19%
Cardboard	Corrugated	Abundant		0%	Global	0.51	81%
Plastic Wrap	Plastic		Fossil, Limited	0%	Global	-	-
Total						**0.62**	**100%**

In conformance with the PCR, product materials were reviewed for the presence of any toxic or hazardous chemicals with respect to US regulations[1]. Based on a review of the product components provided by the manufacturer, no regulated chemicals were identified in the product or product components.

[1] Resource Conservation and Recovery Act (RCRA), Subtitle 3. https://www.epa.gov/rcra/resource-conservation-and-recovery-act-rcra-overview

ADDITIONAL ENVIRONMENTAL INFORMATION

STANLEY® Access Technologies is the only automatic door manufacturer with two US manufacturing facilities; Indianapolis, IN and Farmington, CT.

Stanley's Refurbish Equipment Program means no dumpsters required and no landfills used; oil and grease is recycled.

Our Plant Recycling Program recycles oil and grease, cardboard, white paper and scrap aluminum and steel.

In 2017, STANLEY® Access Technologies' Farmington factory installed a combustion-free Bloom Energy Server for clean energy. This server will deliver enhanced sustainability benefits including high efficiency greenhouse gas emissions, avoid air pollutants and significantly reduce water use.

Our aluminum vendors are ISO 14001 and ISO 50001 certified to control their energy usage and environmental impacts.

PROCESS FLOW DIAGRAM

The diagram below is a representation of the most significant contributions to the life cycle of the STANLEY Access Magic Access Automatic Swing Operators. The following life cycle stages are included: production (Modules A1-A3); construction & installation (Module A4-A5); product use (Modules B1-B7); and end-of-life (Modules C1-C4).

LIFE CYCLE ASSESSMENT OVERVIEW

The system boundary is cradle-to-gate with scenarios and includes resource extraction and processing, product manufacture and assembly, distribution/transport, use and maintenance, and end-of-life. The diagram below illustrates the life cycle stages included in this EPD.

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	Construction - 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	MND	MND	X	X	X	X	X	X	MND

X = Included | MND = Module Not Declared

The following provides a brief overview of the Modules included in the product system for the STANLEY Access Magic Access Automatic Swing Operators.

Module A1: Raw material extraction and processing

This module includes the potential environmental impacts associated with the extraction and processing of raw materials for various component parts in the door products. The primary components are fabricated of aluminum and steel. The impacts from fabrication processes were based on representative datasets for metal product manufacturing.

Module A2: Transportation

This module includes transportation of processed raw materials and product components to the STANLEY manufacturing facilities in Connecticut and Indiana.

Module A3: Manufacture of the Door Products

This stage includes all the relevant manufacturing processes and flows, including the impacts from energy use and emissions at the facility. Production of capital goods, infrastructure, manufacturing equipment, and personnel-related activities are not included. This stage also includes the disposal (including transport) of manufacturing wastes (scrap losses).

Module A4: Transportation & Delivery to the Installation Site

This module includes the impacts associated with delivery of door product to the installation site. Transport by diesel truck an estimated distance of 3,250 km is assumed.

Module A5: Construction & Installation

This module includes installation of the products.   This module includes delivery of the door products to the point of installation (downstream transportation), and installation of the products. This stage also includes the disposal (including transport) of the product packaging materials. The doors are fabricated for specific door openings and applications with no installation waste.

Module B1: Normal use of the product

This module accounts for environmental impacts arising through normal anticipated use of the product. No impacts are associated with the use of the products and the results for this phase are reported as zero.

Module B2: Maintenance

Module not declared.

Module B3: Repair

Module not declared.

Module B4: Replacement

Module not declared.

Module B5: Refurbishment

Module not declared.

Module B6: Operational Energy Use

This module includes the primary energy consumption (electricity) associated with the operational use of these products. Operational energy use is estimated by the manufacturer as 105 kWh/yr based on the power rating of the product and assumed frequency of use.

Module B7: Operational Water Use

No water use occurs during the operation of the product and impacts are zero.

Module C1-C4: End-of-Life

The end-of-life stage of the product starts when it is replaced, dismantled or deconstructed from the building. There are no impacts associated with the deconstruction and dismantling processes as these are manual processes completed with hand tools and does not require any energy input for removal of the product. The impacts associated with transportation of waste materials to processing facilities, waste processing of material components and waste disposal of the product are included in these modules.

LIFE CYCLE IMPACT ASSESSMENT

Impact category indicators are calculated using the TRACI 2.1 and CML-IA characterization methods. TRACI 2.1 impact category indicators include global warming potential (100 years), acidification potential, smog potential, ozone depletion potential, and eutrophication potential. CML-IA impact category indicators include global warming potential (100 years), acidification potential, eutrophication potential, Photochemical Ozone Creation potential, ozone depletion potential, and abiotic resource depletion, in accordance with the PCR. The LCIA results are calculated using openLCA software. The results for these indicators are shown in Table 4.

Table 4. *Life Cycle Impact Assessment results for the STANLEY Access Magic Access Automatic Swing Operators per functional unit. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Impact Category	Unit	Raw Materials	Transport	Manufacturing	Construction	Use	Disposal
TRACI							
Global warming	kg CO_2 eq	70.8	2.04	3.71	5.45	251	0.503
	%	21%	0.61%	1.1%	1.6%	75%	0.15%
Acidification	kg N eq	0.411	8.12x10-3	8.73x10-3	2.12x10-2	1.40	1.98x10-3
	%	22%	0.44%	0.47%	1.1%	76%	0.11%
Eutrophication	kg N eq	0.325	1.93x10-3	1.31x10-2	5.90x10-3	0.708	1.64x10-3
	%	31%	0.18%	1.2%	0.56%	67%	0.16%
Smog formation	kg O_3 eq	4.48	0.205	0.131	0.535	13.4	5.79x10-2
	%	24%	1.1%	0.70%	2.8%	71%	0.31%
Ozone depletion	kg CFC-11 eq	1.88x10-6	3.59x10-8	7.60x10-8	9.33x10-8	5.83x10-6	6.80x10-9
	%	24%	0.45%	0.96%	1.2%	74%	0.09%
Fossil fuel depletion	MJ surplus	53.9	4.09	6.60	10.7	387	0.784
	%	12%	0.88%	1.4%	2.3%	84%	0.17%
CML							
Global warming	kg CO_2 eq	71.4	2.05	3.84	5.53	253	0.530
	%	21%	0.61%	1.1%	1.6%	75%	0.16%
Acidification	kg SO_2 eq	0.411	6.80x10-3	8.17x10-3	1.77x10-2	1.45	1.57x10-3
	%	22%	0.36%	0.43%	0.94%	77%	0.08%
Eutrophication	kg $(PO_4)^{3-}$ eq	0.156	1.72x10-3	5.86x10-3	4.81x10-3	0.363	8.87x10-4
	%	29%	0.32%	1.1%	0.90%	68%	0.17%
Photochemical oxidation	kg C_2H_4 eq	2.74x10-2	3.28x10-4	5.84x10-4	8.94x10-4	6.02x10-2	9.72x10-5
	%	31%	0.37%	0.65%	1.00%	67%	0.11%
Ozone layer depletion	kg CFC-11 eq	1.58x10-6	2.72x10-8	5.72x10-8	7.08x10-8	4.02x10-6	5.13x10-9
	%	27%	0.47%	0.99%	1.2%	70%	0.09%
Abiotic depletion, fossil fuels	MJ	705	28.8	45.9	74.9	3,300	5.23
	%	17%	0.69%	1.1%	1.8%	79%	0.13%

ADDITIONAL ENVIRONMENTAL PARAMETERS

ISO 21930 requires that several parameters be reported in the EPD, including resource use, waste categories and output flows, and other environmental information. The results for these parameters are shown in Table 5. As the products do not contain significant amounts of bio-based materials, biogenic carbon emissions and removals are not declared.

Table 5. *Resource use and waste flows for the automatic doors per functional unit. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Parameter	Unit	Raw Materials	Transport	Manufacturing	Construction	Use	Disposal
Energy Resource Use							
Use of renewable primary energy excluding resources used as raw materials	MJ	158	0.372	19.3	0.966	466	2.86×10^{-2}
	%	25%	0.06%	3.0%	0.15%	72%	0.00%
Use of renewable primary energy resources used as raw materials	MJ	0.00	0.00	0.00	0.00	0.00	0.00
	%	0%	0%	0%	0%	0%	0%
Use of non-renewable primary energy excluding resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA
Use of secondary materials	kg	3.01	0.00	0.00	0.00	0.00	0.00
	%	100%	0.00%	0.00%	0.00%	0.00%	0.00%
Use of secondary fuels	MJ	N/A	N/A	N/A	N/A	N/A	N/A
Recovered energy	MJ	N/A	N/A	N/A	N/A	N/A	N/A
Use of net fresh water	m^3	3.14	2.23×10^{-2}	0.162	5.80×10^{-2}	24.6	2.32×10^{-3}
	%	11%	0.08%	0.58%	0.21%	88%	0.01%
Wastes							
Hazardous waste disposed	kg	4.55×10^{-3}	1.89×10^{-4}	2.08×10^{-4}	4.91×10^{-4}	1.14×10^{-2}	3.48×10^{-5}
	%	27%	1.1%	1.2%	2.9%	68%	0.21%
Non-hazardous waste disposed	kg	15.2	1.42	0.954	3.80	32.7	3.07
	%	27%	2.5%	1.7%	6.6%	57%	5.4%
High-level radioactive wastes disposed	kg	2.45×10^{-4}	1.75×10^{-6}	2.76×10^{-5}	4.54×10^{-6}	3.94×10^{-3}	1.50×10^{-7}
	%	5.8%	0.04%	0.65%	0.11%	93%	0.00%
Low-level radioactive wastes disposed	kg	5.92×10^{-4}	4.16×10^{-6}	1.36×10^{-4}	1.08×10^{-5}	2.00×10^{-2}	3.60×10^{-7}
	%	2.8%	0.02%	0.65%	0.05%	96%	0.00%
Components for Re-use	kg	0.00	0.00	0.00	0.00	0.00	0.00
Materials for Recycling	kg	0.00	0.00	0.00	0.468	0.00	4.20
	%	0.00%	0.00%	0.00%	10%	0.00%	90%
Materials for energy recovery	kg	N/A	N/A	N/A	N/A	N/A	N/A
Exported energy	MJ	N/A	N/A	N/A	N/A	N/A	N/A

INA = Indicator not assessed. No classification scheme is available in OpenLCA to estimate these indicators.

SUPPORTING TECHNICAL INFORMATION

Data Sources

Component	Material Dataset	Processing Dataset	Data Source	Publication Date
PRODUCT COMPONENT				
Recycled Aluminum	market for aluminium, primary, ingot | aluminium, primary, ingot | Cutoff, S/IAI Area, NA	metal working, average for aluminium product manufacturing | metal working, average for aluminium product manufacturing | Cutoff, S/RoW	EI v3.9	2022
	market for aluminium scrap, new | aluminium scrap, new | Cutoff, S/RoW		EI v3.9	2022
	market for aluminium scrap, post-consumer | aluminium scrap, post-consumer | Cutoff, S/GLO		EI v3.9	2022
Aluminum	market for aluminium, primary, ingot | aluminium, primary, ingot | Cutoff, S/IAI Area, North America	metal working, average for aluminium product manufacturing | metal working, average for aluminium product manufacturing | Cutoff, S/RoW	EI v3.9	2022
Steel	steel production, converter, low-alloyed | steel, low-alloyed | Cutoff, S/RoW	metal working, average for steel product manufacturing | metal working, average for stee product manufacturing | Cutoff, S/RoW	EI v3.9	2022
Plastic	polyethylene production, high density, granulate | polyethylene, high density, granulate | Cutoff, S/RoW	injection moulding | injection moulding | Cutoff, S/RoW	EI v3.9	2022
	polyvinylchloride production, bulk polymerisation | polyvinylchloride, bulk polymerised | Cutoff, S/RER		EI v3.9	2022
	acrylonitrile-butadiene-styrene copolymer production | acrylonitrile-butadiene-styrene copolymer | Cutoff, S/RER		EI v3.9	2022
	Polyoxymethylene (POM) PlasticsEurope/EU-27		EI v3.9	2022
	polyurethane production, rigid foam | polyurethane, rigid foam | Cutoff, S/RoW		EI v3.9	2022
	polyvinylchloride production, bulk polymerisation | polyvinylchloride, bulk polymerised | Cutoff, S/RoW		EI v3.9	2022
	synthetic rubber production | synthetic rubber | Cutoff, S/RoW		EI v3.9	2022
	nylon 6-6 production | nylon 6-6 | Cutoff, S/RoW		EI v3.9	2022
Electronics/ Motor Assembly	Electronics, for control units {GLO}| market for | Alloc Rec (46% steel (housing), 32% plastics, 14% printed wiring boards and 8% cables)	Included with material dataset	EI v3.9	2022
PACKAGING				
Cardboard	containerboard production, linerboard, kraftliner | containerboard, linerboard | Cutoff, S/RoW	Included with material dataset	EI v3.9	2022
Plastic Wrap	packaging film production, low density polyethylene | packaging film, low density polyethylene | Cutoff, S/RoW	Included with material dataset	EI v3.9	2022
Paper	kraft paper production | kraft paper | Cutoff, S/RoW	Included with material dataset	EI v3.9	2022
TRANSPORTATION				
Road transport	Diesel Truck	transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, S/RoW	EI v3.9	2022
Ship transport	Transoceanic Ship	transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, S/GLO	EI v3.9	2022
RESOURCES				
Electricity	RFCW eGRID sub-region electricity grid	Electricity, medium voltage, at grid/RFCW	EI v3.9;eGRID	2022; 2020
Electricity	NEWE eGRID sub-region electricity grid	Electricity, medium voltage, at grid/NEWE	EI v3.9;eGRID	2022; 2020
Electricity	US average electricity grid	Electricity, medium voltage, {US} | market for | / Rec	EI v3.9	2022
Natural gas combustion	Natural gas	heat production, natural gas, at boiler modulating >100kW | heat, district or industrial, natural gas | Cutoff, S/RoW	EI v3.9	2022

Data Quality

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage Age of data and the minimum length of time over which data should be 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 10 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 2021.
Geographical Coverage Geographical area from which data for unit processes should be 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 appropriate eGRID electricity grid mixes. Surrogate data used in the assessment are representative of North American or global operations. Data representative of global operations are considered sufficiently similar to actual processes. Data representing product disposal are based on US 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 datasets are used to represent the actual processes, as appropriate.
Precision Measure of the variability of the data values for each data expressed (e.g. variance)	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 door 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. In total, these missing data represent less than 5% of the mass or energy flows.
Representativeness Qualitative assessment of the degree to which the data set reflects the true population of interest (i.e. geographical coverage, time period, and technology coverage)	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 v3.9 data where available. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on assumptions of current average practices in the United States.
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 the STANLEY 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 datasets, Ecoinvent v3.9 LCI data are used.

Allocation

Annual energy resource use and emissions at the STANLEY manufacturing facilities were reported separately for electricity and fuel consumption (natural gas) and allocated to the product based on the cost of production of the product as a fraction of the total facility production costs (i.e., economic allocation).
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.

Impacts from transportation were allocated based on the mass of material and distance transported.

Cut-off criteria

According to the PCR, cumulative omitted mass or energy flows within the product boundary shall not exceed 1%. In the present study, except as noted, all known materials and processes were included in the life cycle inventory.

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