ENVIRONMENTAL PRODUCT DECLARATION

YALE

4400 SERIES DOOR CLOSER

The Yale Locks & Hardware door closer 4400 Series can be used from private to commercial and public sectors both light and heavy applications.

ASSA ABLOY is committed to providing products and services that are environmentally sound throughout the entire production process and the product lifecycle. Our unconditional aim is to make sustainability a central part of our business philosophy and culture, but even more important is the job of integrating sustainability into our business strategy. The employment of EPDs will help architects, designers and LEED-APs select environmentally preferable door openings. The Yale 4400 Series Door Closer EPD provides detailed requirements with which to evaluate the environmental and human health impacts related to producing our door openings. ASSA ABLOY will continue our efforts to protect the environment and health of our customers/end users and will utilize the EPD as one means to document those efforts.

Institut Bauen und Umwelt e.V.

CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

Yale
4400 Series Door Closer

According to EN 15804 and ISO 14025
Dual Recognition by UL Environment and Institut Bauen und Umwelt e.V.

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

PROGRAM OPERATOR	UL Environment
DECLARATION HOLDER	ASSA ABLOY / Yale Locks and Hardware
ULE DECLARATION NUMBER	4786545067.148.1
IBU DECLRATION NUMBER	EPD-ASA-20150177-IBA1-EN
DECLARED PRODUCT	4400 Series Door Closer
REFERENCE PCR	IBU: PCR Locks and fittings (mechanical & electromechanical locks & fittings), 07-2014

DATE OF ISSUE	April 10, 2015
PERIOD OF VALIDITY	5 years

CONTENTS OF THE DECLARATION	General information Product / Product description LCA calculation rules LCA scenarios and further technical information LCA results References
The PCR review was conducted by:	IBU – Institut Bauen und Umwelt e.V. PCR was approved by the Independent Expert Committee (SVA)
The CEN Norm EN 15804 serves as the core PCR. This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	 Wade Stout
This life cycle assessment was independently verified in accordance with EN 15804 and the reference PCR by:	IBU – Institut Bauen und Umwelt e.V.

Environment

1. General Information

Yale Locks & Hardware

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-ASA-20150177-IBA1-EN

This Declaration is based on the Product Category Rules:
Locks and fittings, 07.2014

(PCR tested and approved by the independent expert committee (SVR))

Issue date
10.04.2015

Valid to
09.04.2020

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr.-Ing. Burkhart Lehmann
(Managing Director IBU)

Door Closer – Yale 4400 Series

Owner of the Declaration
Yale Locks & Hardware
3000 Hwy 74 East
Monroe, NC 28112 USA

Declared product / Declared unit
The declaration represents 1 Rack-and-Pinion hydraulic door closer (4400 Series), consisting of the following items:
- A closer body
- A closer arm
- Accessories

Scope:
This declaration and its LCA study are relevant to Yale Locks & Hardware 4400 series door closers.

The primary manufacturing processes are made by external suppliers and the final manufacturing processes and assembly for all door closer components occur at our manufacturing factory in Monroe, NC USA.

Verification

The CEN Standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025
☐ internally ☒ externally

Dr. Wolfram Trinius
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

Product name: Yale 4400 door closers.

Product characteristic: closers are UL Listed and characterized by:
- Cast aluminum body with a rack-and-pinion design
- 4400 Series has adjustable spring sizes 1 through 6 (ADA Compliant)
- 4400 Series is Tri-Style® packaged for regular, top jamb or parallel arm mounting.
- Non-handed
- Rack-and-pinion design
- Cast Aluminum body
- Adjustable closing force and two closing ranges
- Adjustable back check, which offers optimum protection for doors and walls by damped opening
- Adjustable delayed closing which is important for situations where extended closing time is needed for passing through a door
- Self-drilling screws
- Wide range of accessories.

This EPD is applicable to following products: 4400 series.

2.2 Application

The Yale Locks & Hardware door closer 4400 Series can be used – from private to commercial and public sectors both light and heavy:
- Fire & smoke protection and standard doors
- For interior doors
- For interior side of exterior doors
- 4400 series are Tri-Style® packed (for regular, top jamb, or parallel mounting) non-handed allowing for push or pull side left or right hand mounting.

2.3 Technical Data

For the declared product, the following technical data in the delivery status must be provided with reference to the test standard.

Technical data

Name	Value
Adjustable closing force	ANSI/BHMA A156.4 Size 1 - 6
Door width up to	interior - 54 in (1370 mm) exterior - 48 in (1220 mm)
Door weight up to	250 lbs (114 kg)
Fire and smoke protections	Yes
Door swing directions	Non-handed (left or right hand mounted)
Closing speed	Variable between 180° - 10°
Latching speed	Variable between 10° - 0°
Back check	Variable above 70°
Opening angle	Up to 180° depending on arm application
Closer weight	5.52 lbs (2.50 kg)
Closer height	3.88 in (98 mm)
Closer depth	2.13 in (54 mm)
Closer length	13.63 in (346 mm)
Certified to / in compliance with	ANSI/BHMA A156.4 Grade 1 UL Listed UL10C for positive pressure fire doors ADA compliant

2.4 Placing on the market / Application rules

The standards that can be applied for door closer devices and relevant accessories are:
ANSI/BHMA A156.4 Grade 1 for Door Controls - Closers
UL Listed product
ADA Compliant
Exceeds 15 million cycles
4400 series door closers and relevant accessories are certified according to these standards.

2.5 Delivery status

Door closer units and arms are delivered ready for installation. The door closer unit including the packaging has the following dimensions: 387 mm x 156 mm x 89 mm.

2.6 Base materials / Ancillary materials

The primary product components and/or materials must be indicated as a percentage mass to enable the user of the EPD to understand the composition of the product in delivery status.
The average composition for Yale Locks & Hardware 4400 Series closers, including the arm is as following:

Component	Percentage in mass (%)
Aluminum	19.58
Brass	0.39
Steel	66.26
Plastic	7.56
Other	6.21
Total	100.0

2.7 Manufacture

The primary manufacturing processes are made by Tier 1 suppliers located in China, Taiwan, Mexico, and throughout the USA and some primary and the final manufacturing processes occur at factory in Monroe, NC USA. The components come from processes like stamped steel, turning, zinc, forging and aluminum casting. Final assembly takes place in Monroe, NC USA.

The factory of Monroe, NC USA has a certification of Quality Management system in accordance with ISO 9001:2008.

Waste management at the Monroe, NC USA factory is in accordance with the plant's ISO9001 and ISO14001 standards:

- Office paper / cardboard recycling - covered under Solid Waste Recycling Program
- Plant paper / cardboard recycling - covered under Solid Waste Recycling Program
- General trash - covered under Solid Waste Recycling Program
- Comingled recyclables - covered under Solid Waste Recycling Program
- Metals recycling - metal chips and dust - covered under Solid Waste Recycling Program
- Wood pallets - covered under Solid Waste Recycling Program

2.8 Environment and health during manufacturing

ASSA ABLOY and Yale Locks & Hardware are committed to producing and distributing door opening solutions with minimal environmental impact, where health & safety is the primary focus for all employees and associates.
• Environmental operations, GHG, energy, water, waste, VOC, surface treatment and H&S are being routinely monitored. Inspections, audits, and reviews are conducted periodically to ensure that applicable standards are met and Environment Management program effectiveness is evaluated.
• Code of Conduct covers human rights, labor practices and decent work. Management of ASSA ABLOY and Yale Locks & Hardware are aware of their environmental roles and responsibilities, providing appropriate training, supporting accountability and recognizing outstanding performance.

• The factory in Monroe, NC USA has certification of Environmental Management to ISO 14001:2004.
• Any waste metals during machining are separated and recycled. The waste from the water-based painting process is delivered to waste treatment plant.

2.9 Product processing / Installation

Yale Locks & Hardware 4400 series door closers are sold through a variety of distribution and wholesale sources and installed by trained installation technicians, such as locksmiths, carpenters etc. adhering to local/national standards and requirements as well as unskilled laborers. In any case the installation must be done in line with instructions provided by the manufacturer.

Door and frame preparations are made in door manufacturer's production sites or on the job site.

2.10 Packaging

Yale Locks & Hardware 4400 series door closers are packed in cardboard packaging. Packaging includes paper installation instruction – all of which are fully recyclable.

40% + of carton is made from recycled material
100% of paper documents are made from recycled material.

Material	Value (%)
Cardboard/paper	100.0
Total	100.0

2.11 Condition of use
Annual inspection is recommended in order to guarantee correct functionality of the product and the door leaf. The inspection includes: checking, fixing screws to ensure they are properly tight, correct adjustments (closing speeds, force), compliance with local legal inspection standards and greasing all the moving parts of the arm.

2.12 Environment and health during use
There is no harmful emissive potential. No damage to health or impairment is expected under normal use corresponding to the intended use of the product.

2.13 Reference service life
Yale Locks & Hardware 4400 Series door closers were developed to comply with ANSI/BHMA A156.4 Grade 1 standard and quality requirements. The 4400 door closer has surpassed 10 million cycles in testing witnessed and verified by UL. This closer exceeds ANSI/BHMA A156.4 Grade 1 cycle requirements by more than 6 times. The typical life time of a 4400 is 25 years, dependent on frequency of cycles.

2.14 Extraordinary effects
Fire
Yale Locks & Hardware 4400 series door closers are tested for usage in fire and smoke protection doors according to UL10C.

Water
Door closers include hydraulic oil and are designed for conventional use and are not intended for flood protection. Unforeseeable flooding conditions will increase the potential for developing surface rust.

Mechanical destruction
No danger to the environment can be anticipated during mechanical destruction.

2.15 Re-use phase
It is possible to re-use the product during the reference service life and to move it from one door to another. The majority, by weight, of components is aluminum alloy, steel which can be recycled. The plastic components can be used for energy recovery within a waste incineration process.

Yale Locks & Hardware has a Product End-of-Life Recycle Program where product can be returned to Yale for proper recycling/disposal. Once received product is separated and recycled/disposed according to the Solid Waste Recycling Program guidelines.

2.16 Disposal
Lacquer and lubricants contained in the product were treated as a waste for landfill.

2.17 Further information
Yale Locks & Hardware
3000 Hwy 74 East
Monroe, NC 28112 USA
Tel: +800-438-1951
www.yalecommercial.com

3. LCA: Calculation rules

3.1 Declared Unit
The declaration refers to the functional unit of 1 piece of door closer 4400 Series as specified in Part B requirements on the EPD PCR Locks and fittings.

Declared unit

Name	Value	Unit
Declared unit	4.137	Piece of door closer
Conversion factor to 1 kg	0.241	-

3.2 System boundary
Type of the EPD: cradle to gate - with Options
The following life cycle phases were considered:

Production stage:
- A1 – Raw material extraction and processing
- A2 – Transport to the manufacturer and
- A3 – Manufacturing

A4-A5 Construction stage:

- A4 - Transport from the gate to the site
- A5 – Packaging waste processing

End-of-life stage:
- C2 – Transport to waste processing
- C3 – Waste processing
- C4 – Disposal (landfill)

This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues.

- D - Declaration of all benefits or recycling potential from EOL and A5.

3.3 Estimates and assumptions
In the End-of-Life phase a scenario with collection rate of 100% for all the recyclable materials was assumed.

3.4 Cut-off criteria
In the assessment, all available data from the production process are considered, i.e. all raw materials used, auxiliary materials (e.g. lubricants), thermal energy consumption and electric power consumption - including material and energy flows contributing less than 1% of mass or energy (if available). In case a specific flow contributing less than 1% in mass or energy is not available, worst case

assumption proxies are selected to represent the respective environmental impacts.

Impacts relating to the production of machines and facilities required during production are out of the scope of this assessment.

3.5 Background data

For life cycle modeling of the considered products, the GaBi 6 Software System for Life Cycle Engineering, developed by PE INTERNATIONAL AG, is used /GaBi 6 2013/. The GaBi-database contains consistent and documented datasets which are documented in the online
GaBi-documentation /GaBi 6 2013D/.
To ensure comparability of results in the LCA, the basic data of GaBi database were used for energy, transportation and auxiliary materials.

3.6 Data quality

The requirements for data quality and background data correspond to the specifications of the /IBU PCR PART A/.
PE INTERNATIONAL performed a variety of tests and checks during the entire project to ensure high quality of the completed project. This obviously includes an extensive review of project-specific LCA models as well as the background data used.
The technological background of the collected data reflects the physical reality of the declared products. The datasets are complete and conform to the system boundaries and the criteria for the exclusion of inputs and outputs.

All relevant background datasets are taken from the GaBi 6 software database. The last revision of the used background data has taken place not longer than 10 years ago.

3.7 Period under review

The period under review is 2013/14 (12 month average).

3.8 Allocation

Regarding incineration, the software model for the waste incineration plant (WIP) is adapted according to the material composition and heating value of the combusted material. In this EPD the following specific life cycle inventories for the WIP are considered:
• Waste incineration of plastic
• Waste incineration of paper
• Waste incineration of wood

Regarding the recycling material of metals, the metal parts in the EoL are declared as end-of-waste status. Thus, these materials are considered in module D. Specific information on allocation within the background data is given in the GaBi dataset documentation.

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.

4. LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment if modules are not declared (MND).

Installation into the building (A5)

Name	Value	Unit
Output substances following waste treatment on site (Paper packaging)	0.42	kg

Reference service life

Name	Value	Unit
Reference service life	25	a

End of life (C1-C4)

Name	Value	Unit
Collected separately Aluminum, brass, steel, plastics	3.88	kg
Collected as mixed construction waste – construction waste for landfilling	0.26	kg
Reuse plastics parts	0.31	kg
Recycling Aluminum, brass, steel	3.57	kg
Landfilling - Construction waste for landfilling	0.26	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Collected separately waste type Door closer (including packaging)	4.55	kg
Recycling Aluminium	17.79	%
Recycling Brass	0.35	%
Recycling Steel	60.21	%
Thermal Treatment (plastics)	6.88	%
Loss Construction waste for landfilling (no recycling potential)	5.61	%
Reuse Packaging (paper) (from A5)	9.16	%

5. LCA: Results

Results shown below were calculated using CML Methodology.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement[1)]	Refurbishment[1)]	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling- potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 piece of Yale 4400

Parameter	Unit	A1 - A3	A4	A5	C2	C3	C4	D
Global warming potential	[kg CO_2-Eq.]	2.21E+01	1.30E-01	5.91E-01	1.30E-01	0.00E+00	6.47E-01	-1.26E+01
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	4.74E-09	6.22E-13	2.70E-12	6.22E-13	0.00E+00	1.95E-12	3.53E-09
Acidification potential of land and water	[kg SO_2-Eq.]	1.00E-01	5.95E-04	1.35E-04	5.95E-04	0.00E+00	1.65E-04	-6.02E-02
Eutrophication potential	[kg $(PO_4)^{3-}$- Eq.]	7.48E-03	1.36E-04	2.35E-05	1.36E-04	0.00E+00	1.25E-05	-3.45E-03
Formation potential of tropospheric ozone photochemical oxidants	[kg Ethen Eq.]	8.55E-03	-1.92E-04	9.55E-06	-1.92E-04	0.00E+00	8.00E-06	-4.95E-03
Abiotic depletion potential for non fossil resources	[kg Sb Eq.]	6.85E-05	4.90E-09	1.07E-08	4.90E-09	0.00E+00	4.27E-08	-1.49E-05
Abiotic depletion potential for fossil resources	[MJ]	2.60E+02	1.79E+00	1.65E-01	1.79E+00	0.00E+00	2.74E-01	-1.20E+02

RESULTS OF THE LCA - RESOURCE USE: 1 piece of Yale 4400

Parameter	Unit	A1 - A3	A4	A5	C2	C3	C4	D
Renewable primary energy as energy carrier	[MJ]	5.67E+01	-	-	-	-	-	-
Renewable primary energy resources as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-
Total use of renewable primary energy resources	[MJ]	5.67E+01	7.07E-02	1.54E-02	7.07E-02	0.00E+00	2.00E-02	-3.24E+01
Non renewable primary energy as energy carrier	[MJ]	3.07E+02	-	-	-	-	-	-
Non renewable primary energy as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-
Total use of non renewable primary energy resources	[MJ]	3.07E+02	1.80E+00	1.94E-01	1.80E+00	0.00E+00	3.04E-01	-1.38E+02
Use of secondary material	[kg]	7.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	[m^3]	1.43E-01	4.99E-05	1.72E-03	4.99E-05	0.00E+00	1.58E-03	-8.99E-02

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 piece of Yale 4400

Parameter	Unit	A1 - A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed	[kg]	6.10E-03	4.10E-06	1.33E-05	4.10E-06	0.00E+00	2.12E-05	1.51E-03
Non hazardous waste disposed	[kg]	1.56E+00	2.26E-04	1.48E-02	2.26E-04	0.00E+00	6.03E-02	-1.31E+00
Radioactive waste disposed	[kg]	1.85E-02	2.36E-06	1.13E-05	2.36E-06	0.00E+00	1.21E-05	-7.48E-03
Components for re-use	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
Materials for recycling	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.30E+00	0.00E+00	-
Materials for energy recovery	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
Exported electrical energy	[MJ]	0.00E+00	0.00E+00	7.47E-01	0.00E+00	0.00E+00	1.24E+00	-
Exported thermal energy	[MJ]	0.00E+00	0.00E+00	2.11E+00	0.00E+00	0.00E+00	3.39E+00	-

6. LCA: Interpretation

This chapter contains an interpretation of the Life Cycle Impact Assessment categories. Stated percentages in the whole interpretation are related to the overall life cycle, excluding credits (module D).

Production phase (module A1-A3) contributes between 94 and 100% to total impact assessment. This stage is dominated by upstream emissions associated with steel- and secondary aluminum manufacturing processes. Steel accounts with app. 66% to the overall mass of the product, therefore, the impacts are in line with the mass composition of the product.

The environmental impacts for the transport (A2) have a negligible impact within this stage.

In the end-of-life phase, there are loads and benefits (module D, negative values) considered. The benefits are considered beyond the system boundaries and are declared for the recycling potential of the metals and for the credits from the incineration process (energy substitution).

7. Requisite evidence

Not applicable in this EPD.

8. References

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin (pub.): Generation of Environmental Product Declarations (EPDs);

General principles
for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013-04
www.bau-umwelt.de

IBU PCR Part A
IBU PCR Part A: Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. April 2013
www.bau-umwelt.de

IBU PCR Part B
IBU PCR Part B: PCR Guidance-Texts for Building-Related Products and Services. From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU). Part B: Requirements on the EPD for Locks and fittings.
www.bau-umwelt.com

ADA Compliant
ADA Compliant: Americans with Disabilities Act 2010 Standard for Accessible Design

ANSI/BHMA A156.4
ANSI/BHMA A156.4-2013: Standard for Door Controls - Door Closers

DIN EN 1154
DIN EN 1154: Building hardware - Controlled door closing devices - Requirements and test methods (includes amendment A1:2002)

DIN EN ISO 9001
DIN EN ISO 9001:2008: Quality management systems - Requirements; Trilingual version EN ISO 9001:2008

DIN EN ISO 14001
DIN EN ISO 14001: Environmental management systems - Requirements with guidance for use (ISO 14001:2004 + Cor. 1:2009)

DIN EN ISO 14025
DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804
EN 15804:2012+A1:2014: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

GaBi 6 2013
GaBi 6 2013: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2013.

GaBi 6 2013D
GaBi 6 2013D: Documentation of GaBi 6: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2013.
http://documentation.gabi-software.com/

UL Listed
Tested to / Compliant with UL228 Standard for Door Closers - Holders

UL10C
UL10C Positive Pressure Fire Test of Door Assemblies

9. Annex

Results shown below were calculated using TRACI Methodology.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement[1)]	Refurbishment[1)]	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 piece of Yale 4400

Parameter	Parameter	Unit	A1-3	A4	A5	C2	C3	C4	D
GWP	Global warming potential	[kg CO_2-Eq.]	2.21E+01	1.30E-01	5.91E-01	1.30E-01	0.00E+00	6.47E-01	-1.26E+01
ODP	Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.04E-09	6.62E-13	2.87E-12	6.62E-13	0.00E+00	2.07E-12	3.76E-09
AP	Acidification potential of land and water	[kg SO_2-Eq.]	9.86E-02	7.77E-04	1.63E-04	7.77E-04	0.00E+00	1.93E-04	-5.76E-02
EP	Eutrophication potential	[kg N-eq.]	4.22E-03	5.46E-05	9.20E-06	5.46E-05	0.00E+00	5.51E-06	-1.74E-03
Smog	Ground-level smog formation potential	[kg O_3-eq.]	1.23E+00	1.60E-02	3.81E-03	1.60E-02	0.00E+00	1.52E-03	-6.13E-01
Resources		[MJ]	1.96E+01	2.58E-01	1.94E-02	2.58E-01	0.00E+00	2.82E-02	-6.48E+00

RESULTS OF THE LCA - RESOURCE USE: 1 piece of Yale 4400

Parameter	Parameter	Unit	A1-3	A4	A5	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	[MJ]	5.67E+01	-	-	-	-	-	-
PERM	Renewable primary energy resources as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-
PERT	Total use of renewable primary energy resources	[MJ]	5.67E+01	7.07E-02	1.54E-02	7.07E-02	0.00E+00	2.00E-02	-3.24E+01
PENRE	Non renewable primary energy as energy carrier	[MJ]	3.07E+02	-	-	-	-	-	-
PENRM	Non renewable primary energy as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-
PENRT	Total use of non renewable primary energy resources	[MJ]	3.07E+02	1.80E+00	1.94E-01	1.80E+00	0.00E+00	3.04E-01	-1.38E+02
SM	Use of secondary material	[kg]	7.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of non renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	[m³]	1.43E-01	4.99E-05	1.72E-03	4.99E-05	0.00E+00	1.58E-03	-8.99E-02

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 piece of Yale 4400

Parameter	Parameter	Unit	A1-3	A4	A5	C2	C3	C4	D
HWD	Hazardous waste disposed	[kg]	6.10E-03	4.10E-06	1.33E-05	4.10E-06	0.00E+00	2.12E-05	1.51E-03
NHWD	Non hazardous waste disposed	[kg]	1.56E+00	2.26E-04	1.48E-02	2.26E-04	0.00E+00	6.03E-02	-1.31E+00
RWD	Radioactive waste disposed	[kg]	1.85E-02	2.36E-06	1.13E-05	2.36E-06	0.00E+00	1.21E-05	-7.48E-03
CRU	Components for re-use	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
MFR	Materials for recycling	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.30E+00	0.00E+00	-
MER	Materials for energy recovery	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
EEE	Exported electrical energy	[MJ]	0.00E+00	0.00E+00	7.47E-01	0.00E+00	0.00E+00	1.24E+00	-
EET	Exported thermal energy	[MJ]	0.00E+00	0.00E+00	2.11E+00	0.00E+00	0.00E+00	3.39E+00	-

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