EPD Continuous Rooflight

Environmental **P**roduct **D**eclaration
Acc. to ISO 14025 and EN 15804

CI System Continuous Rooflight B | S and Smoke lift B | S (company EPD)

LAMILUX Heinrich Strunz GmbH





Declaration code
EPD-LB-GB-11.3

Environmental Product Declaration in accordance with ISO 14025 and EN 15804

Continuous rooflight and smoke lift

Detailed version

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Holder of the declaration	LAMILUX Heinrich Strunz GmbH Zehstraße 2 D-95111 Rehau
Declaration code	EPD-LB-11.3
Designation of declared product	LAMILUX CI system continuous rooflight B, LAMILUX CI system smoke lift B, LAMILUX CI system continuous rooflight S, LAMILUX CI system smoke lift S
Scope	Daylight systems for increased daylight incidence and natural ventilation and extraction.
Basis	This EPD was compiled in accordance with EN ISO 14025:2011 and EN 15804:2012. In addition the Guidance on preparing Type III Environmental Product Declarations is valid. The Declaration is based on the PCR document „ Fenster, Flachdachfenster, Lichtkuppeln und Lichtbänder“ :(windows, flat roof windows, light domes and continuous rooflights) PCR-FE-2.0 : 2013
Validity	This verified Environmental Product Declaration applies solely to the specified products and is valid for a period of 5 years from the date created.
	Date of publication: 30 September 2013 / Next revision: 30 September 2018
LCA basis	The LCA was prepared in accordance with EN ISO 14040 and EN ISO 14044. The base data includes both the data collected at the production site of Lamilux and generic data from the "GaBi 6“ database. LCA calculations were based on the "cradle to grave“ life cycle including all upstream processes (e.g. raw material extraction, etc.).
Notes on publication	The "Conditions and Guidance on the Use of **ift** Test Documents" apply. The declaration holder assumes full liability for the underlying data, certificates and verifications.

Prof. Ulrich Sieberath Director of Institute	Florian Stich Verifier

Environmental Product Declaration in accordance with ISO 14025 and EN 15804

Continuous rooflight and smoke lift

Detailed version

1 Product definition

Product definition

This EPD applies to:

LAMILUX CI system continuous rooflight B and smoke lift B
LAMILUX CI system continuous rooflight S and smoke lift S

The LCA was prepared using the declared unit:

1 m² area

The functional unit is specified as follows:

	Functional unit
Continuous rooflight B	1.50 m x 8.00 m
Smoke lift B	1.20 m x 2.00 m
Continuous rooflight S	1.50 m x 8.00 m
Smoke lift S	0.82 m x 2.00 m

The functional units are partly different from the requirements in the PCR. As according to the manufacturer they represent the typical production size.

Product description:

- CI system continuous rooflight B (arched design)
  Daylight systems with continuous thermal break for optimized energy performance
  - Active expansion absorbers for absorbing expansion differences between seals and tension belts in cross bars
  - Linear fire safety technology / burn-through protection to prevent fire from spreading onto the roof
  - Integration of smoke and heat exhaust ventilation systems (SHEVS) and SHEVS control panels
  - Dynamic torque control for optimally tensioned and securely anchored glazing in the vent systems
  - Glazing:
    - PC 10-4 ply, + GF/UP, + PC 6-4 ply, + PC 6-4 ply + GF/UP,
    - PC 10-4 + PC 10-4, + GF/UP
    - 32 mm thermal composite B1
    - PC 10 + PC 10 thermal composite 16, + GF/UP
    - Acoustic glazing 36 mm 24 dB
    - Acoustic glazing 16 mm 27 dB
    - Composite 10 mm GF/UP cavity resist
  - Structural mount: installed on sheet steel upstand/frame or wooden trusses (glue laminated wood)
  - Accessories: fall-through proof grating, solar protection, insect protection screen, LSS – LAMILUX Safety Stripe, personal protective equipment (PPE), "hard roofing", colouring by coice

- CI system smoke lift B (arched design)
  Single or double vents for normal or fair weather ventilation
  - As a smoke and heat exhaust system, the CI System Smoke Lift S satisfies all the requirements of DIN EN 12101-2.
  - Multiple flap combinations for market-leading smoke and heat ventilation values
  - Integration as single flap or double flap
  - Quickly opened by means of thermal release, thermal and CO2 remote release or electric remote release
  - All smoke and heat exhaust systems can also be combined with ventilation systems
  - Extremely stable when open

- CI system continuous rooflight S
  Gable roof designed daylight system for flat roofs
  - Bionically dynamic tensioning technology in the ridge area for flexible stress/strain compensation in the case of heavy wind and snow loads
  - Active expansion absorbers for absorbing expansion differences between seals and tension belts in cross bars
  - Dynamic torque control for optimally tensioned and securely anchored glazing in the vent systems
  - Modular vent system for combining size variations for optimally dimensioned smoke exhaust areas
  - Linear fire safety technology / burn-through protection to prevent fire from spreading onto the roof
  - Integration of smoke and heat exhaust ventilation systems (SHEVS) and SHEVS control panels
  - Glazing:
    - PC 10-4 ply, + GF/UP, + PC 6-4 ply, + PC 6-4 ply + GF/UP,
    - PC 32-5 ply, + GF/UP,
    - Composite 10 mm GF/UP cavity resist,
    - Acoustic glazing 16 mm 27 dB
  - Structural mount: installed on steel sheet upstand or wooden trusses (glue laminated wood)
  - Accessories: fall-through proof grating, solar protection, insect protection screen, LSS – LAMILUX Safety Stripe, personal protective equipment (PPE), "hard roofing", colouring by choice

- CI system smoke lift S
  Double vents for normal and fair weather ventilation
  - As a smoke and heat exhaust system, the CI System Smoke Lift S satisfies all the requirements of DIN EN 12101-2.
  - Multiple flap combinations for market-leading smoke and heat ventilation values
  - Integration as single flap or double flap
  - Quickly opened by means of thermal release, thermal and CO2 remote release or electric remote release
  - All smoke and heat exhaust systems can also be combined with ventilation systems
  - Extremely stable when open

For detailed and binding product descriptions and performance specifications of LAMILUX CI system continuous rooflight B and LAMILUX CI system continuous rooflight S refer to the manufacturer specifications at www.lamilux.de or product descriptions of the respective product.

Application Daylight systems for increased daylight incidence and natural ventilation and extraction.

Verifications (optional) The following verifications are held:

- Product quality as per EN 14963
- ETAG 010
- National technical approval Z-10.1-404
- European technical approval 09/0347

Management systems (optional) The following management systems are in place:

- Quality management system as per DIN EN ISO 9001:2008

Additional information For detailed structural characteristics refer to the CE marking and documents accompanying the product.
All performance characteristics have been tested and certified.

2 Materials used

2.1 Primary products

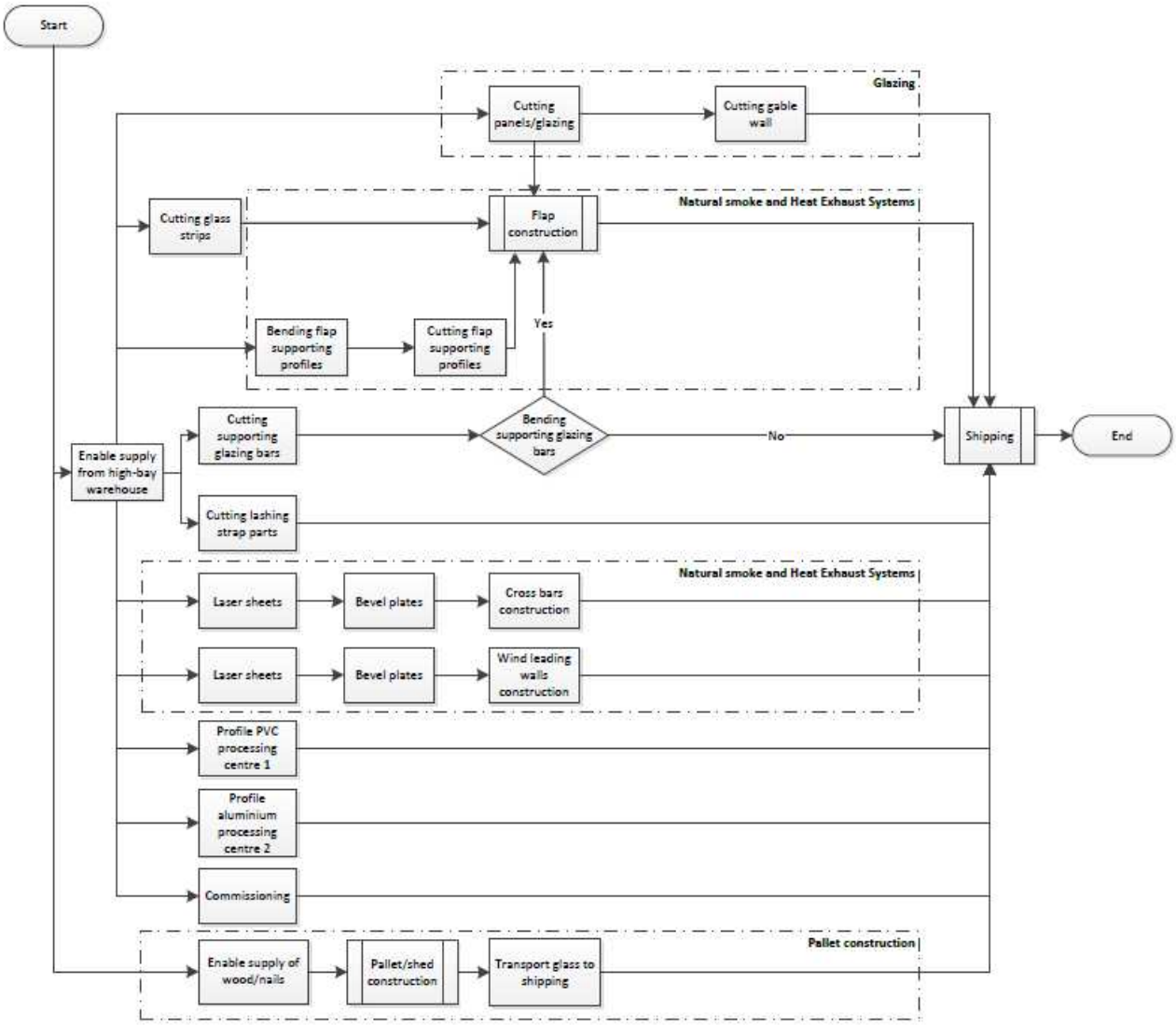
Primary products The primary products used are listed in the LCA (see Section 7).

2.2 Declarable substances

Declarable substances In accordance with the REACH candidate list, no substances of very high concern are contained.

All safety data sheets are available on request from Lamilux.

3 Production stage



4 Construction stage

Processing recommendations - installation

For product-specific installation manuals, instructions for use, assembly instructions and cleaning and maintenance instructions refer to www.lamilux.de.

5 Use stage

Emissions to the environment

No emissions to indoor air, water and soil known, if applicable, VOC emissions.

Reference service life (RSL)

A reference service life of 20 years as per table "Nutzungsdauer von Bauteilen" (service life of building components) from the information platform Nachhaltiges Bauen – Baustoff- und Gebäudedaten (sustainable construction - building materials and building data) (mean value) has been specified for continuous rooflights. Here the following applies:
„Die Datensätze der nun vorliegenden Tabelle können nicht alle zu differenzierenden Einflussfaktoren für die Austauschzyklen von Bauteilen abbilden (Einbauzustände, klimatische Einflüsse, Nutzerbeanspruchung, Instandhaltungskonzept etc.). Auch können nicht alle Bauteilvarianten und –qualitäten differenziert dargestellt werden wie z. B. Schichtdicken von Verzinkungen etc. Zum Teil liegen noch keine ausreichenden Daten vor, zum Teil würde ein zu großer Differenzierungsgrad auch dem vielfach geäußerten Wunsch nach einer noch mit vertretbarem Aufwand zu berücksichtigenden Tabelle entgegenstehen.“ (The data sets of the given table cannot include all the different influential factors relevant to the replacement cycles of building components (built conditions, climatic influences, wear, maintenance concepts, etc). Neither can all the different building component variants and grades/properties, e.g. anodised film thicknesses, etc. be shown in detail. No sufficient data are available yet in some instances, and extreme differentiation would counteract the goal of an applicable table to be used without too much effort.)

For the reference service life the following characteristics apply:

- Declared product characteristics: refer to product definition
- Application parameters for the construction: refer to processing recommendations, additional information
- Expected quality of workmanship: refer to processing recommendations, application
- External conditions: heavy weather conditions e.g. hail or heavy snow loads can have a negative effect on the RSL.
- Internal conditions: no impacts are known that could have a negative effect on the reference service life
- Conditions of use: see Annex scenarios The reference service life solely applies to the specified conditions of use
- Maintenance: refer to scenario B2

The service life solely applies to characteristics specified in this EPD or corresponding references, respectively.

6 End-of-life stage

Possible end-of-life stages

The continuous rooflights are disposed of at central collection points. Normally they are shredded and sorted into their original pure components. Aluminium and steel are recycled. Residual fractions are thermally recycled.

Disposal routes

The LCA includes the average disposal routes.

All life cycle scenarios are detailed in the Annex.

7 Life Cycle Assessment (LCA)

Environmental product declarations are based on life cycle analyses (LCAs) which use material and energy flows for the calculation and subsequent representation of environmental impacts.

As the basis for this, an LCA was prepared for continuous rooflights. The LCA was developed in accordance with EN 15804 and the requirements set out by the international standards EN ISO 14040, EN ISO 14044, ISO 21930 and EN ISO 14025.

The LCA is representative of the products presented in the Declaration and the specified reference period.

The LCA was prepared by brands & values GmbH.

7.1 Definition of goal and scope

Goal

The goal of the LCA is to demonstrate the environmental impacts of continuous rooflights. As set out by EN 15804 the environmental impacts for the whole service life covered by the Environmental Product Declaration are presented in the form of basic information. Apart from these no other environmental impacts have been specified/presented.

Data quality and data availability as well as geographical and time-related system boundaries

The specific data used originate exclusively from the fiscal year 2012. The data were collected on-site at the production plant of Lamilux and originate in parts from company records and partly from direct measurements. Validity of the data was checked by the ift. .

The generic data originate from the professional data base and building materials database of the GaBi 6 software and the ecoinvent database version 2.2. The last update of the GaBi 6 software was in 2013 and the update of ecoinvent in 2010.
Data from before this date originate also from the database and are not more than 4 years old.

No other generic data were used for the calculation.
Data gaps were filled either by comparable data or the data were cut off by restricting the system boundaries.

The life cycle modelled using the sustainability software tool "GaBi 6" for the development of Life Cycle Assessments.

Scope and system boundaries

The system boundaries refer to the supply of raw materials and purchased parts, manufacture/production, use and end-of-life stage of continuous rooflights (cradle to grave).
No additional data from pre-suppliers/subcontractors or other sites were taken into consideration.

Cut-off criteria

All data from the company data collected, i.e. all commodities/input and raw materials used, the thermal energy used as well as electricity consumption were taken into consideration.

The boundaries cover only the product-relevant data. Building sections/parts of facilities that are not relevant to the manufacture of the product were excluded.

The transport distances of primary products are included as generic values.

It can be assumed that the total of negligible processes per life cycle stage does not exceed 5 percent. The life cycle calculation also includes material and energy flows that account for less than 1 percent.

7.2 Inventory analysis

Goal

All material and energy flows are described below. The processes covered are presented as input and output parameters and refer to the declared/functional units.

The models of the unit processes used for the LCA have been documented in a transparent manner.

Life cycle stages

The Annex depicts the entire life cycle of continuous rooflights as follows: product stage A1-A3, construction process stage A4-A5, use stage B1 - B7, end-of-life stage C1 - C4 and benefits and loads beyond the system boundaries D.

Benefits

The following benefits have been defined as per EN 15804:

- Benefits from recycling
- Benefits (thermal and electrical) from incineration

Allocation procedures Allocation of

Resulting production wastes (steel, aluminium, as well as plastic waste) are treated as co-products since there is a market for secondary raw materials.

co-products

The expenses attributable to these co-products are allocated economically (energy consumption) or physically (material consumption).

Allocations for reuse and recycling

If continuous rooflights are reused/recycled in the manufacturing process (rejects) they are shredded and then sorted into their original pure components as necessary. This is realised by different process plants e.g. magnetic separators.

Allocation based on life cycle boundaries

Use of recycled materials in the manufacturing process was based on the current market-specific situation. In parallel to this, a recycling potential was taken into consideration that reflects the economic value of the product after recycling (recyclate). The system boundary set for the recycled material refers to collection.

Inputs

The LCA includes the below production-relevant inputs:

Energy:

The electricity mix is based on "Strommix Deutschland" (German electricity mix). Gas is based on "Erdgas Germany" (German natural gas). In addition, electricity generated from the photovoltaic system of Lamilux was considered as follows:

Facility	Share of electricity from photovoltaic cells
Manufacturing glass elements	4,3 %
Manufacturing glass architecture/continuous rooflights	2,4 %

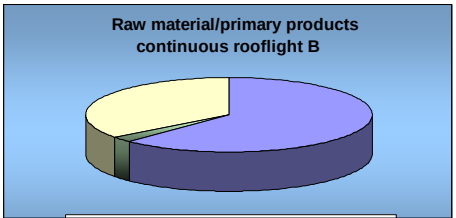
Process heat is partially used for facility heating.

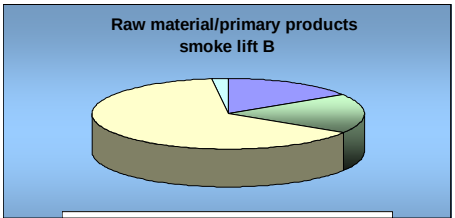
Water

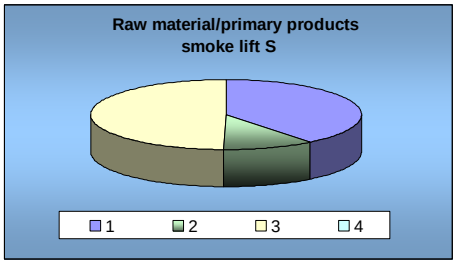
No fresh water is needed for the production of continuous rooflights and smokelifts at Lamilux. The fresh water consumption designated in Section 7.3 is caused by the process chain of primary products.

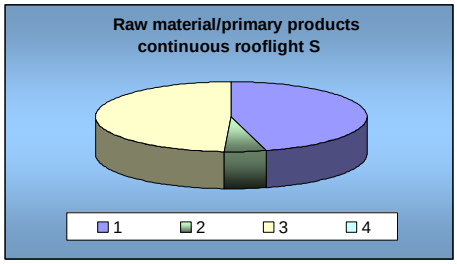
Raw material/primary products:

The following graph shows the use of raw materials/primary products in percent.









No.	Material	Continuous rooflight B Mass in %	Smoke lift B Mass in %	Continuous rooflight S Mass in %	Smoke lift S Mass in %
1	Plastic	62,2	15,7	45,9	39,5
2	(Stainless) steel	2,6	18,1	4,9	10,8
3	Aluminium	35,2	64,3	49,3	49,8
4	Other metals	-	1,9	-	-

Ancillary materials as per EN 15804 (ancillary materials as per ISO 14040):

Gas used for the forklifts is the only relevant ancillary material for real glass variants.

Outputs

The LCA includes the production-relevant outputs per m² continuous rooflight given below:

Waste

Refer to 7.3 Impact assessment
Secondary materials were included in the benefits.

- Open loop (waste recycled into new products)

Wastewater

The manufacturing process of continuous rooflights and smokelifts does not produce any waste water.

7.3 Impact Assessment

Goal

Impact assessment covers inputs and outputs. The impact categories applied are set out below:

Impact assessment

The impact assessment is conducted for the following impact categories. The

categories

characterization factors of ELCD (European Reference Life Cycle Database) are used. The characterization factors for the consumption of abiotic resources are adopted from CML (Institute of Environmental Sciences Faculty of Science Universität Leiden, Niederlande).

- Global warming potential (GWP 100)
- Ozone depletion potential (ODP)
- Acidification potential of soil and water (AP)
- Eutrophication potential (EP)
- Photochemical ozone creation potential (POCP)
- Abiotic depletion potential - non-fossil resources (ADP - elements)
- Abiotic depletion potential – fossil resources (ADP – fossil fuels)

Waste

The waste generated for the production of 1 m² continuous rooflight is evaluated and shown separately for each of the three main fractions, namely trade wastes, special wastes and radioactive wastes. Since waste handling is modelled within system boundaries, the quantities shown are deposited wastes.
Waste is partly generated from the production of primary products. In module A3 no waste was modelled. The designated waste is produced throughout the entire life cycle.

Results per m² continuous rooflight B	Unit	A1 – A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Environmental impacts																
Global warming potential (GWP 100)	kg CO_2 equiv.	61,40	0,42	5,41	-	0,11	5,09	98,30	-	-	-	-	0,05	12,40	0,04	-36,60
Ozone depletion potential (ODP)	kg R11 equiv.	5,51E-07	8,77E-12	3,64E-11	-	2,42E-11	6,17E-08	1,26E-06	-	-	-	-	8,55E-13	2,60E-08	2,03E-11	-9,90E-09
Acidification potential (AP)	kg SO_2 equiv.	0,30	1,98E-03	-1,38E-03	-	1,59E-04	6,19E-03	0,24	-	-	-	-	2,54E-04	0,01	1,21E-04	-0,20
Eutrophication potential (EP)	kg PO_4^{3-}-equiv.	0,02	4,82E-04	-4,33E-05	-	1,38E-04	1,42E-03	0,03	-	-	-	-	6,13E-05	1,58E-03	1,36E-04	-9,65E-03
Photochemical ozone creation potential (POCP)	kg C_2H_4 equiv.	0,02	-6,90E-04	-2,12E-05	-	2,12E-05	9,33E-04	0,02	-	-	-	-	-9,74E-05	4,76E-04	1,93E-05	-0,01
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	5,18E-04	1,94E-08	-3,74E-08	-	3,53E-08	1,19E-03	2,54E-03	-	-	-	-	1,86E-09	5,52E-06	7,60E-09	-4,43E-04
Abiotic depletion potential – fossil resources (ADP – fossil fuels)	MJ	1.010,00	5,76	-34,50	-	0,64	68,90	1.320,00	-	-	-	-	0,62	23,80	0,59	-445,00
Use of resources	**Unit**	**A1 – A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy – excluding renewable primary energy resources used as raw materials	MJ	257,00	0,34	0,08	-	0,03	1,15	255,00	-	-	-	-	0,03	1,78	0,03	-133,00
Use of renewable primary energy resources used as raw material (material use)	MJ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	257,00	0,34	0,08	-	0,03	1,15	256,00	-	-	-	-	0,03	1,78	0,03	-133,00
Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	1.010,00	5,76	-34,50	-	0,64	68,80	1.330,00	-	-	-	-	0,62	23,80	0,59	-445,00
Use of non renewable primary energy resources used as raw materials (material use))	MJ	1,38E-07	9,89E-12	5,83E-11	-	4,52E-11	-2,24E-05	-6,96E-06	-	-	-	-	8,59E-13	1,88E-05	3,69E-11	-3,69E-08
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy +material use)	MJ	1.010,00	5,76	-34,50	-	0,64	68,80	1.320,00	-	-	-	-	0,62	23,80	0,59	-445,00
Use of secondary material	kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of renewable secondary fuels	MJ	0,02	4,29E-05	-	-	7,96E-04	-0,01	-6,55E-03	-	-	-	-	4,23E-06	1,85E-04	4,42E-04	-9,86E-03
Use of non-renewable secondary fuels	MJ	0,15	4,48E-04	-1,76E-04	-	8,31E-03	-0,12	-0,09	-	-	-	-	4,43E-05	1,94E-03	1,06E-03	-0,09
Use of net fresh water	m³	194,00	0,03	0,08	-	0,05	5,87	136,00	-	-	-	-	2,58E-03	3,68	0,02	-136,00

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

Results per m² continuous rooflight B	Unit	A1 – A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Waste categories																
Hazardous waste disposed	kg	-	-	-	-	-	-0,13	-0,27	-	-	-	-	-	-	-	-
Non hazardous waste disposed	kg	153,00	0,04	0,25	-	0,10	22,80	226,00	-	-	-	-	2,92E-03	8,83	0,71	-73,00
Radioactive waste disposed	kg	0,05	8,27E-06	5,09E-05	-	2,11E-05	1,99E-03	0,06	-	-	-	-	8,77E-07	7,74E-04	1,05E-05	-0,02
Output material flows	**Unit**	**A1 – A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for reuse	kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Materials for recycling	kg	-	-	0,01	-	-	1,96	9,94	-	-	-	-	-	3,00	-	-
Materials for energy recovery	kg	0,37	-	3,32	-	-	0,16	16,80	-	-	-	-	-	4,56	-	-
Exported energy	MJ	2,84	-	25,90	-	-	2,47	163,40	-	-	-	-	-	50,70	-	-

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

Results per m² smoke lift B	Unit	A1 – A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Environmental impacts																
Global warming potential (GWP 100)	kg CO_2 equiv.	92,00	0,33	-	-	0,63	5,09	65,20	-	-	-	-	0,02	3,87	0,02	-69,60
Ozone depletion potential (ODP)	kg R11 equiv.	9,59E-07	6,78E-12	-	-	6,34E-11	6,17E-08	1,88E-06	-	-	-	-	4,60E-13	2,63E-08	7,67E-12	-1,05E-07
Acidification potential of soil and water (AP)	kg SO_2 equiv.	0,48	1,53E-03	-	-	2,07E-03	6,19E-03	0,16	-	-	-	-	1,00E-04	6,09E-03	5,29E-05	-0,42
Eutrophication potential (EP)	kg PO_4^{3-}-equiv.	0,03	3,72E-04	-	-	2,40E-04	1,42E-03	0,02	-	-	-	-	2,42E-05	1,44E-03	4,17E-05	-0,02
Photochemical ozone creation potential (POCP)	kg C_2H_4 equiv.	0,03	-5,33E-04	-	-	2,45E-04	9,33E-04	0,02	-	-	-	-	-3,44E-05	3,06E-04	8,72E-06	-0,02
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	2,96E-03	1,50E-08	-	-	1,03E-07	1,19E-03	4,25E-03	-	-	-	-	1,02E-09	4,01E-06	2,93E-09	-2,01E-03
Abiotic depletion potential – fossil resources (ADP – fossil fuels)	MJ	1.180,00	4,45	-	-	26,44	68,90	967,00	-	-	-	-	0,30	15,90	0,22	-816,00
Use of resources	**Unit**	**A1 – A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy – excluding renewable primary energy resources used as raw materials	MJ	293,00	0,26	-	-	0,21	1,15	40,30	-	-	-	-	0,02	1,21	0,01	-276,00
Use of renewable primary energy resources used as raw material (material use)	MJ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	293,00	0,26	-	-	0,21	1,15	40,00	-	-	-	-	0,02	1,21	0,01	-276,00
Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	1.180,00	4,45	-	-	26,44	68,80	964,00	-	-	-	-	0,30	15,90	0,22	-817,00
Use of non renewable primary energy resources used as raw materials (material use))	MJ	1,60E-06	7,64E-12	-	-	6,31E-11	-2,24E-05	4,05E-07	-	-	-	-	5,19E-13	2,11E-05	1,39E-11	-8,17E-08
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy +material use)	MJ	1.180,00	4,45	-	-	26,44	68,80	964,00	-	-	-	-	0,30	15,90	0,22	-817,00
Use of secondary material	kg	-		-	-	-	-	-	-	-	-	-	-	-	-	-
Use of renewable secondary fuels	MJ	-	3,31E-05	-	-	9,79E-04	-0,01	-0,05	-	-	-	-	2,25E-06	9,29E-05	1,72E-04	-0,02
Use of non-renewable secondary fuels	MJ	-	3,46E-04	-	-	0,01	-0,12	-0,49	-	-	-	-	2,35E-05	9,72E-04	4,11E-04	-0,14
Use of net fresh water	m³	302,00	0,02	-	-	0,23	5,87	63,10	-	-	-	-	1,34E-03	3,41	7,70E-03	-280,00

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

Results per m² smoke lift B	Unit	A1 – A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Waste categories																
Hazardous waste disposed	kg	0,06	-	-	-	-	-0,13	-0,15	-	-	-	-	-	-	-	-4,03E-04
Non hazardous waste disposed	kg	234,00	0,03	-	-	0,47	22,80	192,00	-	-	-	-	1,87E-03	4,55	0,54	-166,00
Radioactive waste disposed	kg	0,07	6,39E-06	-	-	1,26E-04	1,99E-03	0,04	-	-	-	-	4,34E-07	3,78E-04	3,79E-06	-0,05
Output material flows	**Unit**	**A1 – A3**	**A4.1**	**A5**	**B1**	**B2 insg.**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for reuse	kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Materials for recycling	kg	-	-	-	-	-	1,96	18,70	-	-	-	-	-	7,39	-	-
Materials for energy recovery	kg	-	-	-	-	-	0,16	2,91	-	-	-	-	-	1,29	-	-
Exported energy	MJ	-	-	-	-	-	2,47	7,41	-	-	-	-	-	3,12	-	-

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

Results per m² continuous rooflight S	Unit	A1 – A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Environmental impacts																
Global warming potential(GWP 100)	kg CO_2 equiv.	92,50	0,53	5,65	-	0,11	5,09	99,40	-	-	-	-	0,05	12,20	0,05	-67,40
Ozone depletion potential (ODP)	kg R11 equiv.	9,45E-07	1,11E-11	3,80E-11	-	2,42E-11	6,17E-08	2,05E-06	-	-	-	-	1,02E-12	3,62E-08	2,10E-11	-2,05E-08
Acidification potential of soil and water (AP)	kg SO_2 equiv.	0,47	2,50E-03	-1,44E-03	-	1,59E-04	6,19E-03	0,20	-	-	-	-	2,94E-04	4,71E-03	1,27E-04	-0,38
Eutrophication potential (EP)	kg PO_4^{3-}-equiv.	0,03	6,08E-04	-4,49E-05	-	1,38E-04	1,42E-03	0,02	-	-	-	-	7,08E-05	1,83E-03	1,38E-04	-0,02
Photochemical ozone creation potential (POCP)	kg C_2H_4 equiv.	0,03	-8,69E-04	-2,17E-05	-	2,12E-05	9,33E-04	0,02	-	-	-	-	-1,11E-04	3,29E-04	2,05E-05	-0,02
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	1,13E-03	2,44E-08	-3,90E-08	-	3,53E-08	1,19E-03	2,42E-03	-	-	-	-	2,22E-09	5,80E-07	7,90E-09	-1,11E-03
Abiotic depletion potential – fossil resources (ADP – fossil fuels)	MJ	1.450,00	7,27	-36,00	-	0,64	68,90	1.460,00	-	-	-	-	0,74	13,30	0,61	-809,00
Use of resources	**Unit**	**A1 – A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy – excluding renewable primary energy resources used as raw materials	MJ	379,00	0,43	0,09	-	0,03	1,15	257,00	-	-	-	-	0,04	0,90	0,03	-254,00
Use of renewable primary energy resources used as raw material (material use)	MJ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	379,00	0,43	0,09	-	0,03	1,15	256,00	-	-	-	-	0,04	0,90	0,03	-254,00
Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	1.450,00	7,27	-36,00	-	0,64	68,80	1.450,00	-	-	-	-	0,74	13,30	0,61	-809,00
Use of non renewable primary energy resources used as raw materials (material use))	MJ	1,10E-03	1,25E-11	6,09E-11	-	4,52E-11	-2,24E-05	2,20E-03	-	-	-	-	1,04E-12	2,56E-05	3,82E-11	-7,21E-08
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy +material use)	MJ	1.450,00	7,27	-36,00	-	0,64	68,80	1.460,00	-	-	-	-	0,74	13,30	0,61	-809,00
Use of secondary material	kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of renewable secondary fuels	MJ	0,02	5,40E-05	-	-	7,96E-04	-0,01	-0,01	-	-	-	-	5,05E-06	4,07E-05	4,60E-04	-0,02
Use of non-renewable secondary fuels	MJ	0,19	5,65E-04	-3,07E-04	-	8,31E-03	-0,12	-0,15	-	-	-	-	5,29E-05	4,26E-04	1,10E-03	-0,15
Use of net fresh water	m³	317,00	0,03	0,09	-	0,05	5,87	136,00	-	-	-	-	3,07E-03	3,71	0,02	-259,00

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

Results per m² continuous rooflight S	Unit	A1 – A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Waste categories																
Hazardous waste disposed	kg	7,69E-05	-	-	-	-	-0,13	-0,27	-	-	-	-	-	-	-	-
Non hazardous waste disposed	kg	231,00	0,04	0,26	-	0,10	22,80	226,00	-	-	-	-	3,58E-03	1,65	0,82	-144,00
Radioactive waste disposed	kg	0,07	1,04E-05	5,33E-05	-	2,11E-05	1,99E-03	0,06	-	-	-	-	1,04E-06	2,18E-04	1,08E-05	-0,04
Output material flows	**Unit**	**A1 – A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for reuse	kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Materials for recycling	kg	-	-	0,01	-	-	1,96	15,60	-	-	-	-	-	5,82	-	-
Materials for energy recovery	kg	0,39	-	3,47	-	-	0,16	17,20	-	-	-	-	-	4,57	-	-
Exported energy	MJ	2,97	-	27,05	-	-	2,47	189,70	-	-	-	-	-	62,60	-	-

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

Results per m² smoke lift S	Unit	A1 – A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Environmental impacts																
Global warming potential(GWP 100)	kg CO_2 equiv.	95,20	0,40	-	-	0,63	5,09	83,30	-	-	-	-	0,03	9,65	0,04	-69,70
Ozone depletion potential (ODP)	kg R11 equiv.	9,50E-07	8,41E-12	-	-	6,34E-11	6,17E-08	2,07E-06	-	-	-	-	5,71E-13	4,27E-08	1,90E-11	-1,89E-08
Acidification potential of soil and water (AP)	kg SO_2 equiv.	0,45	1,90E-03	-	-	2,07E-03	6,19E-03	0,15	-	-	-	-	1,24E-04	4,20E-03	1,18E-04	-0,40
Eutrophication potential (EP)	kg PO_4^{3-}-equiv.	0,02	4,62E-04	-	-	2,40E-04	1,42E-03	0,02	-	-	-	-	3,00E-05	1,95E-03	1,22E-04	-0,02
Photochemical ozone creation potential (POCP)	kg C_2H_4 equiv.	0,03	-6,61E-04	-	-	2,45E-04	9,33E-04	0,02	-	-	-	-	-4,27E-05	3,13E-04	1,90E-05	-0,02
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	8,48E-04	1,86E-08	-	-	1,03E-07	1,19E-03	2,51E-03	-	-	-	-	1,26E-09	-2,47E-06	7,17E-09	-7,83E-04
Abiotic depletion potential – fossil resources (ADP – fossil fuels)	MJ	1.410,00	5,53	-	-	26,44	68,90	1.390,00	-	-	-	-	0,38	11,40	0,55	-832,00
Use of resources	**Unit**	**A1 – A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy – excluding renewable primary energy resources used as raw materials	MJ	285,00	0,33	-	-	0,21	1,15	49,60	-	-	-	-	0,02	0,59	0,03	-262,00
Use of renewable primary energy resources used as raw material (material use)	MJ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	285,00	0,33	-	-	0,21	1,15	51,20	-	-	-	-	0,02	0,59	0,03	-262,00
Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	1.410,00	5,53	-	-	26,44	68,80	1.380,00	-	-	-	-	0,38	11,50	0,55	-832,00
Use of non renewable primary energy resources used as raw materials (material use))	MJ	1,75E-06	9,49E-12	-	-	6,31E-11	-2,24E-05	1,09E-05	-	-	-	-	6,44E-13	2,62E-05	3,46E-11	-7,19E-08
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy +material use)	MJ	1.410,00	5,53	-	-	26,44	68,80	1.390,00	-	-	-	-	0,38	11,50	0,55	-832,00
Use of secondary material	kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of renewable secondary fuels	MJ	-	4,11E-05	-	-	9,79E-04	-0,01	-0,02	-	-	-	-	2,79E-06	7,69E-07	4,18E-04	-2,38E-03
Use of non-renewable secondary fuels	MJ	-	4,30E-04	-	-	0,01	-0,12	-0,22	-	-	-	-	2,92E-05	8,07E-06	1,00E-03	-
Use of net fresh water	m³	293,00	0,02	-	-	0,23	5,87	-222,00	-	-	-	-	1,67E-03	3,55	0,02	-267,00

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

Results per m² smoke lift S	Unit	A1 – A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Waste categories																
Hazardous waste disposed	kg	0,06	-	-	-	-	-0,13	-0,43	-	-	-	-	-	-	-	-
Non hazardous waste disposed	kg	203,00	0,03	-	-	0,47	22,80	471,00	-	-	-	-	2,32E-03	0,34	0,83	-149,00
Radioactive waste disposed	kg	0,06	7,93E-06	-	-	1,26E-04	1,99E-03	0,12	-	-	-	-	5,38E-07	1,29E-04	9,74E-06	-0,05
Output material flows	**Unit**	**A1 – A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for reuse	kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Materials for recycling	kg	-	-	-	-	-	1,96	51,50	-	-	-	-	-	6,62	-	-
Materials for energy recovery	kg	-	-	-	-	-	0,16	25,10	-	-	-	-	-	4,02	-	-
Exported energy	MJ	-	-	-	-	-	2,47	384,00	-	-	-	-	-	61,60	-	-

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

7.4 Interpretation, LCA presentation and critical verification

Interpretation

All modules with values were considered in the interpretation.

Regarding the indicator global warming potential, the different percentage and absolute share of the materials aluminium, plastics and steel leads to different contributions in various life cycle stages. The smaller proportion of aluminium in continuous rooflight B leads to comparatively low emissions in the production, whereas the thermal conversion of plastics causes an increase in emissions in module C3, due to its higher mass. Another factor is the thermal conversion of the packaging (made of wood) which does not apply to other variants (smoke lift B and smoke lift S), as they are sold without packaging. The energy (electricity and heat) which is generated by thermal conversion was credited respectively. The emissions saved thereby were added together with those that are saved through the recycling of metals. In comparison, the higher proportion of aluminium plays a bigger role.

The depicted environmental impacts are suitable for the certification of buildings.

Report

The LCA report was prepared in accordance with the requirements of EN ISO 14040, EN ISO 14044, EN 15804 and ISO 14025. The report is not addressed to third parties due to confidential information contained in the report.

The results of the study are not designed to be used for comparative statements intended for publication.

The results and conclusions reported to the target group are complete, correct, without bias and transparent.

Critical verification

The LCA was critically verified by Florian Stich**,** an independent verifier.

8 General information regarding the EPD

Comparability

This EPD was prepared in accordance with EN 15804 and is therefore only comparable to those EPDs that that also comply with EN 15804.
For a comparison of EPDs for construction products the rules as set out by EN 15804 (Clause 5.3) apply.

Communication

The communications format of this EPD meets the requirements of EN 15942:2011 and is therefore the basis for B2B communication. Only the nomenclature has been changed according to EN 15804.

Verification

Verification of the Environmental Product Declaration is documented in accordance with the **ift** "Richtlinie zur Erstellung von Typ III Umweltproduktdeklarationen" (Guidance on preparing Type III Environmental Product Declarations) in accordance with the requirements set out by ISO 14025.

Product group: Daylight systems
Declaration code: EPD-LB-11.3

Date created: 30 September 2013
Next revision: 30 September 2018

This Declaration is based on the **ift** PCR document „Fenster, Flachdach Fenster, Lichtkuppeln und Lichtbänder“ :(windows, flat roof windows, light domes and continuous rooflights). PCR-FE-1.1 : 2013

The European standard EN 15804 serves as the core PCR.
Independent verification of the declaration, according to ISO 14025:2010 ☒ internal ☐ external
Independent third party verifier Florian Stich
[a] Product category rules

Revision of this document:

Ser. No.	Date	Comment	LCA analyst	Verifier
1	27/09/2013	first internal verfication and release	Y.Bernard	F.Stich
2				
3				
4				
5				

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Beuth Verlag GmbH, Berlin

[38] ETAG 010
Guideline for european technical approval of self supporting translucent roof kits (2002)
EOTA, Brussels

[39] Zulassung Z-10.1-404 (Authorization)
Selbsttragendes lichtdurchlässiges Dachbausystem `CI-System Lichtband B` nach ETA-09/0347 (self supporting translucent roof kits `CI-System continuous rooflight B` according to ETA-09/0347)
DIBT Berlin, 2010

[40] Zulassung ETA-09/0347 (Authorization)
CI-System Lichtband B. Selbsttragendes lichtdurchlässiges Dachbausystem (CI-System continuous roof light B. self supporting translucent roof kits)
DIBT Berlin, 2013

[41] EN 1873:2006-03
Prefabricated accessories for roofing - Individual roof lights of plastics - Product specification and test methods
Beuth Verlag GmbH, Berlin

Annex: Description of life cycle scenarios for continuous rooflights and smoke lifts

Product stage			Construction process stage		Use stage							End-of-life stage				Benefits and loads beyond the system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport	Construction / Installation	Use	Maintenance	Repair	Replacement	Modification/refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste management	Disposal	Re-use Recovery Recycling potential

Calculation of the scenarios was based on a service life of 50 years (in accordance with the table "Nutzungsdauern von Bauteilen" [service life of building components] of the information portal "Nachhaltiges Bauen – Baustoff- und Gebäudedaten – 'mittlerer Wert'") (Sustainable construction - data of building materials and buildings - "average value").
Furthermore, the scenarios of the research project "EPDs for transparent building components" were used.

The scenarios selected are presented in bold type.

A4 Transport - continuous rooflight B incl. smoke lift B

No.	Scenario	Description
A4.1	**Direct shipment to construction site/branch Domestic**	**40 t truck Euro 4, 30 percent capacity used, approx. 350km to domestic construction site and return trip with 0 percent load Weight: 98.693 kg Volume: 2.592 m³**
A4.2	Direct shipment to construction site/branch Abroad	40 t truck Euro 4, 30 percent capacity used, approx. 900 km to construction site abroad and return trip with 0 percent load Weight: 98.693 kg Volume: 2.592m³

A4 Transport	Unit	A4.1	A4.2	A4.1	A4.2
Environmental impacts		**Continuous rooflight B**	**Continuous rooflight B**	**Smoke lift B**	**Smoke lift B**
Global warming potential(GWP 100)	kg CO_2 equiv.	**0,42**	1,08	**0,33**	0,84
Ozone depletion potential (ODP)	kg R11 equiv.	**8,77E-12**	2,26E-11	**6,78E-12**	1,74E-11
Acidification potential of soil and water (AP)	kg SO_2 equiv.	**1,98E-03**	5,10E-03	**1,53E-03**	3,94E-03
Eutrophication potential (EP)	kg PO_4^{3-}-equiv.	**4,82E-04**	1,24E-03	**3,72E-04**	9,58E-04
Photochemical ozone creation potential (POCP)	kg C_2H_4 equiv.	**-6,90E-04**	-1,77E-03	**-5,33E-04**	-1,37E-03
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	**1,94E-08**	4,98E-08	**1,50E-08**	3,85E-08
Abiotic depletion potential - fossil resources (ADP - fossil fuels)	MJ	**5,76**	14,80	**4,45**	11,50
Use of resources					
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	**0,34**	0,34	**0,26**	0,68
Use of renewable primary energy resources used as raw material (material use)	MJ	**-**	-	**-**	-
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	**0,34**	0,88	**0,26**	0,68
Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	**5,76**	14,80	**4,45**	11,50
Use of non renewable primary energy resources used as raw materials (material use))	MJ	**9,89E-12**	2,54E-11	**7,64E-12**	1,97E-11
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy +material use)	MJ	**5,76**	14,80	**4,45**	11,50
Use of secondary material	kg	**-**			-
Use of renewable secondary fuels	MJ	**4,29E-05**	1,10E-04	**3,31E-05**	8,52E-05
Use of non-renewable secondary fuels	MJ	**4,48E-04**	1,15E-03	**3,46E-04**	8,91E-04
Use of net fresh water	m^3	**0,03**	0,07	**0,02**	0,05

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

A4 Transport	Unit	A4.1	A4.2	A4.1	A4.2
Waste categories		Continuous rooflight B	Continuous rooflight B	Smoke lift B	Smoke lift B
Hazardous waste disposed	kg	**-**	-	**-**	-
Non hazardous waste disposed	kg	**0,04**	0,09	**0,03**	0,07
Radioactive waste disposed	kg	**8,27E-06**	2,13E-05	**6,39E-06**	1,64E-05
Output material flows					
Components for reuse	kg	**-**	-	**-**	-
Materials for recycling	kg	**-**	-	**-**	-
Materials for energy recovery	kg	**-**	-	**-**	-
Exported energy	MJ	**-**	-	**-**	-

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

A4 Transport - continuous rooflight S incl. smoke lift S

No.	Scenario	Description
A4.1	**Direct shipment to construction site/branch Domestic**	**40 t truck Euro 4, 30 percent capacity used, approx. 350km to domestic construction site and return trip with 0 percent load Weight: 134.051 kg Volume: 5.20 m³ or**
A4.2	Direct shipment to construction site/branch Abroad	40 t truck Euro 4, 30 percent capacity used, approx. 900 km to construction site abroad Weight: 134.051 kg Volume: 5.20 m³

A4 Transport	Unit	A4.1	A4.2	A4.1	A4.2
Environmental impacts		**Continuous rooflight S**	**Continuous rooflight S**	**Smoke lift S**	**Smoke lift S**
Global warming potential(GWP 100)	kg CO_2 equiv.	**0,53**	1,36	**0,40**	1,04
Ozone depletion potential (ODP)	kg R11 equiv.	**1,11E-11**	2,84E-11	**8,41E-12**	2,16E-11
Acidification potential of soil and water (AP)	kg SO_2 equiv.	**2,50E-03**	6,43E-03	**1,90E-03**	4,89E-03
Eutrophication potential (EP)	kg PO_4^{3-}-equiv.	**6,08E-04**	1,56E-03	**4,62E-04**	1,19E-03
Photochemical ozone creation potential (POCP)	kg C_2H_4 equiv.	**-8,69E-04**	-2,24E-03	**-6,61E-04**	-1,70E-03
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	**2,44E-08**	6,28E-08	**1,86E-08**	4,78E-08
Abiotic depletion potential - fossil resources (ADP - fossil fuels)	MJ	**7,27**	18,70	**5,53**	14,20
Use of resources					
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	**0,43**	1,11	**0,33**	0,84
Use of renewable primary energy resources used as raw material (material use)	MJ	**-**	-	**-**	-
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	**0,43**	1,11	**0,33**	0,84
Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	**7,27**	18,70	**5,53**	14,20
Use of non renewable primary energy resources used as raw materials (material use))	MJ	**1,25E-11**	3,21E-11	**9,49E-12**	2,44E-11
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy +material use)	MJ	**7,27**	18,70	**5,53**	14,20
Use of secondary material	kg	**-**		**-**	
Use of renewable secondary fuels	MJ	**5,40E-05**	1,39E-04	**4,11E-05**	1,06E-04
Use of non-renewable secondary fuels	MJ	**5,65E-04**	1,45E-03	**4,30E-04**	1,11E-03
Use of net fresh water	m^3	**0,03**	0,08	**0,02**	0,06

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

A4 Transport	Unit	A4.1	A4.2	A4.1	A4.2
Waste categories		**Continuous rooflight S**	**Continuous rooflight S**	**Smoke lift S**	**Smoke lift S**
Hazardous waste disposed	kg	**-**	-	**-**	-
Non hazardous waste disposed	kg	**0,04**	0,12	**0,03**	0,09
Radioactive waste disposed	kg	**1,04E-05**	2,68E-05	**7,93E-06**	2,04E-05
Output material flows					
Components for reuse	kg	**-**	-	**-**	-
Materials for recycling	kg	**-**	-	**-**	-
Materials for energy recovery	kg	**-**	-	**-**	-
Exported energy	MJ	**-**	-	**-**	-

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

A5 Construction / Installation

No.	Scenario	Description
A5.1	Manually	Continuous rooflights/smoke lifts are installed without additional lifting devices!
A5.2	**Crane/inclined lift**	**A crane/inclined lift is required for the installation of the elements.**

Installation of continuous rooflights forms part of the site management and is covered at the building level.

B1 Use

Refer to Section 5 Emissions to the environment

B2 Maintenance

B2.1 Cleaning

No.	Scenario	Description
B2.1.1	**Rarely manual**	**Manually using suitable cleaning agents, annually during functional test of SHEVS (refer to B2.2)**

Ancillary materials, energy use and waste as well as transport distances during cleaning are negligible.

The data in the following table is valid for continuous rooflight B and S and smoke lift B and S.

B2.1 Cleaning	Unit	B2.1.1
Environmental impacts		
Global warming potential(GWP 100)	kg CO_2 equiv.	**0,11**
Ozone depletion potential (ODP)	kg R11 equiv.	**2,42E-11**
Acidification potential of soil and water (AP)	kg SO_2 equiv.	**1,59E-04**
Eutrophication potential (EP)	kg PO_4^{3-}-equiv.	**1,38E-04**
Photochemical ozone creation potential (POCP)	kg C_2H_4 equiv.	**2,12E-05**
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	**3,53E-08**
Abiotic depletion potential - fossil resources (ADP - fossil fuels)	MJ	**0,64**
Use of resources		
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	**0,03**
Use of renewable primary energy resources used as raw material (material use)	MJ	**-**
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	**0,03**
Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	**0,64**
Use of non renewable primary energy resources used as raw materials (material use))	MJ	**4,52E-11**
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy +material use)	MJ	**0,64**
Use of secondary material	kg	**-**
Use of renewable secondary fuels	MJ	**7,96E-04**
Use of non-renewable secondary fuels	MJ	**8,31E-03**
Use of net fresh water	m^3	**0,05**

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

B2.1 Cleaning	Unit	B2.1.1
Waste categories		
Hazardous waste disposed	kg	**-**
Non hazardous waste disposed	kg	**0,10**
Radioactive waste disposed	kg	**2,11E-05**
Output material flows		
Components for reuse	kg	**-**
Materials for recycling	kg	**-**
Materials for energy recovery	kg	**-**
Exported energy	MJ	**-**

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

B2.2 Maintenance

No.	Scenario	Description
B2.2.1	**Normal use smoke lift B and S**	**Annual functional test of SHEVS, visual inspection, lubrication and maintenance if necessary**

Ancillary materials and waste as well as transportation distances during maintenance are negligible. Fresh water and energy are not needed for maintenance.

The data in the following table is valid for smoke lift B and S.

B2 Maintenance	Unit	B2.2.1
Environmental impacts		
Global warming potential(GWP 100)	kg CO_2 equiv.	**0,52**
Ozone depletion potential (ODP)	kg R11 equiv.	**3,92E-11**
Acidification potential of soil and water (AP)	kg SO_2 equiv.	**1,91E-03**
Eutrophication potential (EP)	kg PO_4^{3-}-equiv.	**1,02E-04**
Photochemical ozone creation potential (POCP)	kg C_2H_4 equiv.	**2,24E-04**
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	**6,76E-08**
Abiotic depletion potential - fossil resources (ADP - fossil fuels)	MJ	**25,80**
Use of resources		
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	**0,18**
Use of renewable primary energy resources used as raw material (material use)	MJ	**-**
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	**0,18**
Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	**25,80**
Use of non renewable primary energy resources used as raw materials (material use))	MJ	**1,79E-11**
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy +material use)	MJ	**25,80**
Use of secondary material	kg	**-**
Use of renewable secondary fuels	MJ	**1,83E-04**
Use of non-renewable secondary fuels	MJ	**1,93E-03**
Use of net fresh water	m^3	**0,18**

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

B2 Maintenance	Unit	B2.1
Waste categories		
Hazardous waste disposed	kg	**-**
Non hazardous waste disposed	kg	**0,36**
Radioactive waste disposed	kg	**1,05E-04**
Output material flows		
Components for reuse	kg	**-**
Materials for recycling	kg	**-**
Materials for energy recovery	kg	**-**
Exported energy	MJ	**-**

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

B3 Repair

No.	Scenario	Description
B3.1	**Normal use**	**One replacement* of hardware 5.328 kg, seals/gaskets 0.224 kg/m²**

* Assumptions for evaluation of possible environmental impacts; statements made do not constitute any guarantee or warranty of performance.

Ancillary materials, waste, fresh water resources, material losses, transport distances and energy use during repair are negligible. In scenario B3 there will be balanced just building parts, where the expected useful life is lesser then the RSL.

The data in the following table is valid for continuous rooflight B and S and smoke lift B and S.

B3 Repair	Unit	B3.1
Environmental impacts		
Global warming potential(GWP 100)	kg CO_2 equiv.	**5,09**
Ozone depletion potential (ODP)	kg R11 equiv.	**6,17E-08**
Acidification potential of soil and water (AP)	kg SO_2 equiv.	**6,19E-03**
Eutrophication potential (EP)	kg PO_4^{3-}-equiv.	**1,42E-03**
Photochemical ozone creation potential (POCP)	kg C_2H_4 equiv.	**9,33E-04**
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	**1,19E-03**
Abiotic depletion potential - fossil resources (ADP - fossil fuels)	MJ	**68,90**
Use of resources		
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	**1,15**
Use of renewable primary energy resources used as raw material (material use)	MJ	**-**
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	**1,15**
Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	**68,80**
Use of non renewable primary energy resources used as raw materials (material use))	MJ	**-2,24E-05**
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy +material use)	MJ	**68,80**
Use of secondary material	kg	**-**
Use of renewable secondary fuels	MJ	**-0,01**
Use of non-renewable secondary fuels	MJ	**-0,12**
Use of net fresh water	m^3	**5,87**

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

B3 Repair	Unit	B3.1
Waste categories		
Hazardous waste disposed	kg	**-0,13**
Non hazardous waste disposed	kg	**22,80**
Radioactive waste disposed	kg	**1,99E-03**
Output material flows		
Components for reuse	kg	**-**
Materials for recycling	kg	**1,96**
Materials for energy recovery	kg	**0,16**
Exported energy	MJ	**2,47**

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

B4 Replacement

Two replacements are necessary during the assumed service life of 50 years.

Energy use, material losses, transport distances and water consumption during replacement are negligible. Data referring to end-of-life parts in kg.

No.	Scenario	Description
B4.1	**Normal use**	**Two replacements within 50 years.**

B4 Replacement	Unit	B4.1	B4.1	B4.1	B4.1
Environmental impacts		Continuous rooflight B	Smoke lift B	Continuous rooflight S	Smoke lift S
Global warming potential(GWP 100)	kg CO_2 equiv.	**98,30**	**65,20**	**99,40**	**83,30**
Ozone depletion potential (ODP)	kg R11 equiv.	**1,26E-06**	**1,88E-06**	**2,05E-06**	**2,07E-06**
Acidification potential of soil and water (AP)	kg SO_2 equiv.	**0,24**	**0,16**	**0,20**	**0,15**
Eutrophication potential (EP)	kg PO_4^{3-}-equiv.	**0,03**	**0,02**	**0,02**	**0,02**
Photochemical ozone creation potential (POCP)	kg C_2H_4 equiv.	**0,02**	**0,02**	**0,02**	**0,02**
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	**2,54E-03**	**4,25E-03**	**2,42E-03**	**2,51E-03**
Abiotic depletion potential - fossil resources (ADP - fossil fuels)	MJ	**1.320,00**	**967,00**	**1.460,00**	**1.390,00**
Use of resources					
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	**255,00**	**40,30**	**257,00**	**49,60**
Use of renewable primary energy resources used as raw material (material use)	MJ	**-**	**-**	**-**	**-**
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	**256,00**	**40,00**	**256,00**	**51,20**
Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	**1.330,00**	**964,00**	**1.450,00**	**1.380,00**
Use of non renewable primary energy resources used as raw materials (material use))	MJ	**-6,96E-06**	**4,05E-07**	**2,20E-03**	**1,09E-05**
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy +material use)	MJ	**1.320,00**	**964,00**	**1.460,00**	**1.390,00**
Use of secondary material	kg	**-**	**-**	**-**	**-**
Use of renewable secondary fuels	MJ	**-6,55E-03**	**-0,05**	**-0,01**	**-0,02**
Use of non-renewable secondary fuels	MJ	**-0,09**	**-0,49**	**-0,15**	**-0,22**
Use of net fresh water	m^3	**136,00**	**63,10**	**136,00**	**-222,00**

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

B4 Replacement	Unit	B4.1	B4.1	B4.1	B4.1
Waste categories		**Continuous rooflight B**	**Smoke lift B**	**Continuous rooflight S**	**Smoke lift S**
Hazardous waste disposed	kg	**-0,27**	**-0,15**	**-0,27**	**-0,43**
Non hazardous waste disposed	kg	**226,00**	**192,00**	**226,00**	**471,00**
Radioactive waste disposed	kg	**0,06**	**0,04**	**0,06**	**0,12**
Output material flows					
Components for reuse	kg	**-**	**-**	**-**	**-**
Materials for recycling	kg	**9,94**	**18,70**	**15,60**	**51,50**
Materials for energy recovery	kg	**16,80**	**2,91**	**17,20**	**25,10**
Exported energy	MJ	**163,40**	**7,41**	**189,70**	**384,00**

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

B5 Upgrade/Refurbishment (not relevant)

Upgrade/refurbishment of continuous rooflights is not assumed.

B6 Operational energy use (not relevant)

No energy consumption when used as intended.

B7 Operational water use (not relevant)

No water consumption when used as intended. Water consumption for cleaning is specified in module B2.1.

C1 De-construction

No.	Scenario	Description
C1.1	Dismantling	99 % de-construction The energy consumed for de-construction is negligible. Resulting expenditures are marginal.

Due to a simple dismountability, a correspondingly high de-construction rate is assumed.

C2 Transport

No.	Scenario	Description
C2.1	Transport	Transport to collection point using 40 t truck, 80 % capacity used, 50 km distance

C2 Transport	Unit	C2.1	C2.1	C2.1	C2.1
Environmental impacts		**Continuous rooflight B**	**Smoke lift B**	**Continuous rooflight S**	**Smoke lift S**
Global warming potential (GWP 100)	kg CO_2 equiv.	**0,05**	**0,02**	**0,05**	**0,03**
Ozone depletion potential (ODP)	kg R11 equiv.	**8,55E-13**	**4,60E-13**	**1,02E-12**	**5,71E-13**
Acidification potential of soil and water (AP)	kg SO_2 equiv.	**2,54E-04**	**1,00E-04**	**2,94E-04**	**1,24E-04**
Eutrophication potential (EP)	kg PO_4^{3-}-equiv.	**6,13E-05**	**2,42E-05**	**7,08E-05**	**3,00E-05**
Photochemical ozone creation potential (POCP)	kg C_2H_4 equiv.	**-9,74E-05**	**-3,44E-05**	**-1,11E-04**	**-4,27E-05**
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	**1,86E-09**	**1,02E-09**	**2,22E-09**	**1,26E-09**
Abiotic depletion potential - fossil resources (ADP - fossil fuels)	MJ	**0,62**	**0,30**	**0,74**	**0,38**
Use of resources					
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	**0,03**	**0,02**	**0,04**	**0,02**
Use of renewable primary energy resources used as raw material (material use)	MJ	**-**	**-**	**-**	**-**
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	**0,03**	**0,02**	**0,04**	**0,02**
Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	**0,62**	**0,30**	**0,74**	**0,38**
Use of non renewable primary energy resources used as raw materials (material use))	MJ	**8,59E-13**	**5,19E-13**	**1,04E-12**	**6,44E-13**
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy +material use)	MJ	**0,62**	**0,30**	**0,74**	**0,38**
Use of secondary material	kg	**-**	**-**	**-**	**-**
Use of renewable secondary fuels	MJ	**4,23E-06**	**2,25E-06**	**5,05E-06**	**2,79E-06**
Use of non-renewable secondary fuels	MJ	**4,43E-05**	**2,35E-05**	**5,29E-05**	**2,92E-05**
Use of net fresh water	m^3	**2,58E-03**	**1,34E-03**	**3,07E-03**	**1,67E-03**

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

C2 Transport	Unit	C2.1	C2.1	C2.1	C2.1
Waste categories		**Continuous rooflight B**	**Smoke lift B**	**Continuous rooflight S**	**Smoke lift S**
Hazardous waste disposed	kg	**-**	**-**	**-**	**-**
Non hazardous waste disposed	kg	**2,92E-03**	**1,87E-03**	**3,58E-03**	**2,32E-03**
Radioactive waste disposed	kg	**8,77E-07**	**4,34E-07**	**1,04E-06**	**5,38E-07**
Output material flows					
Components for reuse	kg	**-**	**-**		
Materials for recycling	kg	**-**	**-**		
Materials for energy recovery	kg	**-**	**-**		
Exported energy	MJ	**-**	**-**		

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

C3 Waste management

No.	Scenario	Description
C3.1	Disposal	Recirculation of aluminium 98 %, recirculation of other metals 90 %, residual fractions in waste incinerator 90 %

Disposal processes are described in the following table and shown in per cent by weight. The calculation of the percentage is expressed per declared unit.

C3 Disposal	Unit	C3.1	C3.1	C3.1	C3.1
		Continuous rooflight B	Smoke lift B	Continuous rooflight S	Smoke lift S
Collection process , collect separately	kg	-	-	-	-
Collection process, collect with mixed construction waste	kg	8,14	9,13	11,06	11,30
Recovery system, for re-use	kg	-	-	-	-
Recovery system, for recycling	kg	3,00	7,39	5,82	6,62
Recovery system, for energy recovery	kg	4,56	1,29	4,57	4,02
Disposal	kg	0,59	0,44	0,67	0,65

All values marked with [-] are either marginal, not available or can not be stated. Irrelevant modules are described in the annex.

C4 Disposal

No.	Scenario	Description
C4.1	Disposal	Non-recordable amounts and losses within the re-use/recycling chain (C1 and C3) will be modelled as "disposed". The expenditures can not be quantified.

D Benefits and loads beyond the system boundaries

No.	Scenario	Description
D	Recycling potential	Metals from C3.1 excluding the scrap used in A3 replaces metal at 100 % Aluminium from C3.1 excluding the aluminium recyclate used in A3 replaces aluminium at 100 % Benefits from waste incinerator: electricity replaces German electricity mix, thermal energy replaces thermal energy from natural gas.

Imprint

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Notes

This EPD is mainly based on the work and findings of the Institut für Fenstertechnik e.V., Rosenheim (**ift** Rosenheim) and specifically on the **ift-**Richtlinie NA-01/1 Allgemeiner Leitfaden zur Erstellung von Typ III Umweltproduktdeklarationen (Guideline NA.01/1 – Guidance on the Preparation of Type III Environmental Product Declarations).

Layout

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