ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	VELUX A/S
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-VEL-20220138-IBJ1-EN
Issue date	25/07/2022
Valid to	24/07/2027

VELUX flat roof window CVP - grid-connected

VELUX A/S

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1. General Information

VELUX A/S	Velux flat roof windows CVP - grid-connected
Programme holder IBU – Institut Bauen und Umwelt e.V. Hegelplatz 1 10117 Berlin Germany	**Owner of the declaration** VELUX A/S Ådalsvej 99, 2970 Hørsholm, Denmark
Declaration number EPD-VEL-20220138-IBJ1-EN	**Declared product / declared unit** The declaration represents 1 piece of a grid-connected VELUX flat roof window CVP Q of the size 1.20 m x 1.20 m = 1.44 m^2
This declaration is based on the product category rules: Windows, other translucent building components, doors and related products, 01.2021 (PCR checked and approved by the SVR)	**Scope:** The declaration covers 100% of grid-connected VELUX flat roof windows CVP Q and CVP U by Partizánske Building Components SK, Slovenia.
Issue date 25/07/2022	The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.
Valid to 24/07/2027	The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard will be simplified as *EN 15804*.
Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	**Verification** The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data according to *ISO 14025:2011* ☐ internally ☒ externally
Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	Dr. Eva Schmincke (Independent verifier)

2. Product

2.1 Product description/Product definition

The grid-connected Velux flat roof windows CVP Q consist of a motorised base unit made of a PVC curb with an integrated glazing unit and hinges on one side to allow for venting. The product has insulation in 4 chambers.

The grid-connected Velux flat roof windows CVP U consist of a motorised base unit made of a PVC curb with integrated glazing unit and hinges on one side to allow for venting. The product is similar to CVP Q, but with adifferent glazing unit and only insulation in 2 chambers.

On the of the base unit is installed a one-layer opaque or transparent acrylic (PMMA) dome.

For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) *Regulation (EU) No. 305/2011 (CPR)* applies. The product needs a declaration of performance taking into consideration *EN 1873:2005*, Prefabricated accessories for roofing - Individual rooflights of plastics - Product specification and test methods and the CE-marking.
For the application and use the respective national provisions apply.

2.2 Application

Velux flat roof windows CVP are used in renovation and new build.

2.3 Technical Data

The Declaration of Performance including relevant technical specifications and test methods/test standards can be downloaded from the website www.velux.com/ce.
The declared values in the table relate to the reference product incl. an average pane. For other covered product variants, specific values can be selected at the bottom of the above-mentioned download page

Constructional data for CVP 120120 73Q+ISD 0000
For other variants, see velux.com/ce

Name	Value	Unit
Reaction to fire	-	class

Resistance to upward load EN 1875	UL 1500	-
water permeability acc. to EN 13985, EN 1027	-	class
Resistance to downward load EN 1873	UL 2500	-
Resistance to fire EN 13501-2	NPD	-
External fire performance EN 13501-5	NPD	-
Water tightness EN 1873	passed	-
Impact resistance - small hard body passed EN 1873	passed	-
Impact resistance - large soft body EN 1873	SB 1200	-
Direct airborne sound insulation EN ISO 418-3	36 (-1;-4)	dB
Thermal transmittance EN 1873	0,80	W/(m2K)
Luminous transmittance EN 410	0,72	-
Air permability EN 1026	4	Class
Durability EN 1873	NDP	-

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to

- *EN 1873:2005*, Prefabricated accessories for roofing - Individual rooflights of plastics - Product specification and test methods.

2.4 Delivery status
The product is available in pre-defined sizes covering 0,6x0,6m to 1,5x1,5m.

2.5 Base materials/Ancillary materials
Composition of the base unit CVP:

PVC 40 %
galvanized steel 10 %
laminated glass 25 %
tempered glass 15 %
others

Composition of the top unit (ISD 0000A):

PMMA 95 %
iron & cast iron 5 %

Composition of the motor (CVP):

glavanized steel 40 %
stainless steel 15 %
PSU A04 casted 10 %
copper wire 10 %
DC motor 5 %

1) "This product/article/at least one partial article contains substances listed in the *candidate list* (date: 02.03.2022) exceeding 0.1 percentage by mass:

- no

2) "This product/article/at least one partial article contains other CMR substances in categories 1A or 1B which are not on the *candidate list*, exceeding 0.1 percentage by mass:

- not investigated with suppliers

3) "Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) *Regulation on Biocidal Products No. 528/2012*):

- no

2.6 Manufacture
Base unit:
PVC profiles, gaskets, rain sensor, motor cover and wires and other minor components are produced outside Velux.
Motor and wall switch are assembled at production site in Czech republic.
The insulating glass unit is assembled at a production site in France.
Minor ABS plastic and glass fibre components are produced at a factory in Denmark.
The production and final assembly of the base unit takes place at the production site in Slovakia.
The final production processes include preparation of the PVC frame/sash profiles by cutting, milling and drilling and installation of EPS foam. The final PVC base is assembled by cutting, deburring and welding, cutting and mounting of gaskets and installation of the glazing unit, window opener incl. gas springs as well as packaging, stacking and wrapping of the product on pallets.

Top unit:
The plastic dome is produced and assembled at a production site in Germany.
The final production processes include forming/blow moulding of the plastic dome, with afterward deburring, engraving and assembly, as well as packaging, stacking and wrapping of the product on pallets.

The factories are *ISO 9001* certified.

2.7 Environment and health during manufacturing
All factories are *ISO 14001* and *ISO 45001* certified.

2.8 Product processing/Installation
The product is delivered to the customer in two parts, a top and bottom part. After the hole in the roof is prepared, the bottom part of the product can be installed with the use of a screwdriver, after which the top unit can be fastened to the bottom unit.

2.9 Packaging
The packaging usually consists of:
- polyethylene film
- polystyrene foam parts
- cardboard

The use of other packaging materials is possible, but insignificant in terms of quantity.

The plastic packaging (polyethylene (PE) film, polystyrene foam parts) can be recycled if separated by type; alternatively, they can be incinerated.

2.10 Condition of use
The material composition of VELUX flat roof windows does not change over their service life.

2.11 Environment and health during use
VELUX flat roof windows do not contain any pollutants that could be released during use.

Environmental protection: According to current knowledge, hazards to water, air and soil cannot arise when the products are used as intended.

Health protection: According to current knowledge, no health hazards or impairments are to be expected.

2.12 Reference service life

It is not possible to calculate the reference service life according to *ISO 15686*. The service life based on a manufacturer's declaration is 30 years. The corresponding utilization scenario is declared in 4.

2.13 Extraordinary effects

Fire

Fire performance according to EN 13501:1

Name	Value
Building material class	B
Burning droplets	s1
Smoke gas development	d0

Water

In the event of unforeseen exposure to water (flood), VELUX flat roof windows must be replaced as electrical components; no adverse effects on human health or the environment are to be expected.

Mechanical destruction

In the event of unforeseen mechanical destruction, VELUX flat roof windows must be replaced; apart from potential injuries from glass cullet, no adverse effects on human health or the environment are to be expected.

2.14 Re-use phase

VELUX flat roof windows can be dismantled manually without any problems. The metal parts are usually recycled, and the plastic parts and wood are sent for thermal recycling for energy recovery. Flat glass can be recycled whereas laminated glass is usually used as secondary aggregate in road construction or landfilling.

2.15 Disposal

VELUX flat roof windows are mostly inert and can be disposed of in an appropriate landfill. However, due to the value of the materials or the carbon content of the plastic parts and wood, recycling or energy recovery is preferable and common.

Waste code according to the *European Waste List* (Regulation on the European Waste List):

16 02 14 electronic parts
17 02 01 wood
17 02 02 glass
17 02 03 plastics
17 04 14 mixed metals

2.16 Further information

Further documentation on the products, technical data sheets, BIM files, etc. can be found at:

www.velux.com

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is 1 piece of a grid-connected VELUX flat roof window CSF with a fixed base unit made of a PVC curb with an integrated glazing unit with 1.20 m x 1.20 m = 1.44 m^2.

Declared unit

Name	Value	Unit
Declared unit	1	pce.
Area	1.44	m^2
Weight	82,6	kg

3.2 System boundary

Type of EPD: Cradle to gate with options, with modules C1 – C4, and module D (A1-A3, C1-C3, D and additional modules

The production of VELUX flat roof windows (**modules A1-A3**) includes raw material extraction, energy generation, waste treatment and all transports up to the factory gate. In accordance with *COUNCIL REGULATION (EU) No 333/2011*, secondary metals are modeled as part of the product system from the moment they are available as unmixed scrap.
Waste or secondary fuels are not used for production.

Module A4 is not declared due to large variances in transport distances between the production site and the construction site, where the product is installed.

Module A5: The products are delivered to the construction site ready to be installed. Manual installation is assumed, and electricity consumption related to electric drilling machines, screw drivers, etc. is considered to be negligible. The combustible packaging material (plastics, wood, etc.) is assumed to be thermally treated in a municipal waste incineration plant with an efficiency R1 < 0.6 (according to the *ecoinvent* dataset used); the recovered energy is declared as exported energy. Metals and cardboard are recycled; it is assumed that these fractions reach the end-of-waste state after having been sorted and transported (as a conservative choice) to a recycler. No packaging waste is landfilled.

Modules B1 to B7 are not relevant for the product under consideration or no significant environmental impacts occur.

Module C1 includes manual dismantling, with no significant environmental impact.

Module C2 comprises the transport of the dismantled VELUX flat roof window to a sorting plant and then to a waste incineration plant for the thermally treated plastic fraction.

Modules C3/C4: given the complexity of the inventoried products, a mixed end-of-life scenario is modelled, allowing the different materials to follow their most likely path.
As a rule of thumb, metals are recycled and plastics are incinerated (also due to the very limited data

availability of plastics recycling and its benefits); coated and uncoated flat glass is assumed to be recycled whereas laminated glass is assumed to be landfilled due to very limited recycling potential.
Metals and flat glass recycled; it is assumed that these fractions reach an end-of-waste state after having been sorted and transported to a recycler; laminated glass is landfilled. The combustible material (plastics, wood, etc.) is assumed to be thermally treated in a municipal waste incineration plant.

Module D includes the benefits and burdens associated with recycling metals beyond the system boundary, resulting from the treatment of recycled materials from the point of end-of-waste to the point of substitution (as loads) and substitution of primary resources (as benefits).
It also includes the benefits and burdens associated with energy recovery from plastic waste in a municipal waste incineration plant, as modeled in Module C3.
In Module D, only net flows of metals leaving the product system are considered.

3.3 Estimates and assumptions

No further assumptions and estimates relevant to the result had to be made beyond the points made in this chapter 3 and in chapter 4.

3.4 Cut-off criteria

No data available from the company survey was neglected. These include, among other things, material use, energy demand (heat, electricity), packaging materials of raw materials (insofar as they are generated as waste) and product packaging, consumables in production, waste treatment and the transport of all inputs and outputs.
With this approach, mass and energy flows below 1 % were also accounted for. No processes were neglected that would have been known to the project managers and would have contributed significantly to the indicators of the impact assessment.

3.5 Background data

Ecoinvent 3.8 (2021) is used as the background database.

3.6 Data quality

The foreground data are based on extensive and detailed data collection at the production site. The foreground data could be fully linked with corresponding data records from the background database *ecoinvent 3.8*.
The background data was updated in 2021. Thus, the quality of the foreground and background data can be rated as very good.

3.7 Period under review

The LCA data represents the production conditions for the year 2021.

3.8 Allocation

No co-products are generated during the production of the VELUX products. Sorted production scrap of the different metals, notably aluminium, is considered a secondary material with no economic value (so no burdens allocated) and considered in the quantification of net flows leaving the product system. This approach is chosen to ensure a coherent quantification of net flows entering module D.
Biogenic carbon is allocated based on physical flows regardless of the allocation procedure chosen for the process. The biogenic carbon content of wood products entering or leaving the product system is quantified (manually) as part of the GWP in conformity with *DIN EN 16485*.

No processes were modelled as part of the foreground model that would have required an allocation of multi-input processes. Background datasets on municipal waste incineration plants were taken from *ecoinvent* without any modification.

Allocation of reuse, recycling and recovery was avoided by the cut-off approach in the foreground model in line with *DIN EN 15804*.

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.

Ecoinvent 3.8 (2021) is used as the background database.

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic carbon

Information on describing the biogenic carbon content at factury gate

Name	Value	Unit
Biogenic Carbon Content in product	0.097	kg C
Biogenic Carbon Content in accompanying packaging	1.98	kg C

Module A5

The products are delivered to the construction site ready to be installed. Manual installation is assumed; electricity consumption related to electric drilling machines, screw drivers, etc. is considered to be negligible.
The combustible packaging material (plastics, wood, etc.) is assumed to be transported 50 km with a lorry 16-32 metric tons, EURO6 to an incineration plant with an efficiency R1 < 0.6 (according to the *ecoinvent* dataset used); the recovered energy is declared as exported energy; for its quantification an efficiency of 25.6 % is assumed for the production of heat and 13.0 % for the production of electricity (always referring to the lower heating value of the waste).
Metals and cardboard are recycled; it is assumed that these fractions reach the end-of-waste state after having been sorted and transported (as a conservative

choice) to a recycler over 150 km with a lorry 16-32 metric tons, EURO6.
No packaging waste is landfilled.
The use of multi-way pallets is not taken into account as packaging material.

Reference service life

Name	Value	Unit
Reference service life according to manufacturer's declaration	30	a
Declared product properties (at the gate) and finishes	The product has passed internal quality controls and complies with EN 1873 for CE marking	-
Design application parameters (if instructed by the manufacturer), including the references to the appropriate practices and application codes	Installation according to assembly instructions and state of the art.	-
An assumed quality of work, when installed in accordance with the manufacturer’s instructions	Carried out in accordance with the manufacturer's instructions.	-
Outdoor environment, (for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature	The declared products are intended for installation outside the building: They are therefore designed to withstand outdoor conditions throughout their service life.	-
Indoor environment (for indoor applications), e.g. temperature, moisture, chemical exposure	The declared products are not intended for installation inside a building.	-
Usage conditions, e.g. frequency of use, mechanical exposure	Standard use in any type of building, i.e. opening/ closing as often as necessary.	-
Maintenance e.g. required frequency, type and quality and replacement of components	The declared products are designed for a reference life of 30 years, with the motor replaced every 15 years. They are maintained by cleaning water at the discretion of the building occupants.	-

Module B1
The products are assumed to have no direct emissions during the use phase. The indicator values of Module B1 are thus 0. For biogenic carbon stored in product, see above.

Module B2
The maintenance scenario (B2) covers the replacement of the motor over the service life of the product. Given that the detailed composition of the motor and its electronic components is not known, potential loads and benefits related to the motor and electronics are disregarded.
Annual cleaning with water (e.g., using 1 l/m2 of tap water per annual cleaning) is neglected.

Module B6
For motor-operated flat roof windows, electricity is used both in stand-by and during operations.

Module C1
Manual de-installation is assumed, electricity consumption related to electric screw drivers, etc. is considered to be negligible. Thus, no environmental impacts are declared in module C1.

Module C2
Given the complexity of the inventoried products, a mixed end-of-life scenario is modelled, allowing the different materials to follow their most likely path.
It should also be noted that the deconstruction and waste treatment scenario can vary a lot, depending on the actual situation. Thus, a generic end-of-life scenario is assumed.
As a rule of thumb, metals are recycled, plastics are incinerated (also due to the very limited availability on plastics recycling and its benefits); coated and uncoated flat glass is assumed to be recycled whereas laminated glass is assumed to be landfilled due to very limited recycling potential.
The combustible material (plastics, wood, etc.) is assumed to be transported 50 km with a lorry 16-32 metric tons, EURO6 to an incineration plant.
Metals and flat glass recycled; it is assumed that these fractions reach end-of-waste state after having been sorted and transported to a recycler over 150 km with a lorry 16-32 metric tons, EURO6.
Laminated glass is landfilled, including a transport of 30 km with a lorry 16-32 metric tons, EURO6.

Module C3
A consumption of 0.03 kWh/kg of electricity for shredding and sorting and 0.437 MJ/kg of diesel fuel for internal logistics are taken into account to disassemble the product. The recovered material leaves the product system as “materials for recycling”. The net amounts of the metals leaving the product system are considered as “use of secondary material” in Module D.

Module C4
As stated above, it is assumed that 100 % of the plastic parts and the wooden parts are treated in a waste incineration plant with an efficiency R1 < 0.6 (according to the *ecoinvent* dataset used); 25.57 % of the lower heating value of the plastic parts are recovered as heat and 13.0 % as electricity.
Recovered energy is reported as “exported energy” and considered in Module D.
Some of the material, notably laminated flat glass is assumed to be landfilled.

Module D
Module D contains the benefits and loads beyond the system boundary related to the recycling of metals, which result from the treatment of recycled materials from the point of end-of-waste status to the point of substitution (as loads) and the substitution of primary resources (as benefits).
Furthermore, it includes the benefits of raw material substitution of the recycling of flat glass, with the exception of laminated glass, which cannot be used for the production of glass again. Recovered flat glass is assumed to have reached the end-of-waste state as sorted glass cullet; glass cullet is assumed to replace virgin raw material for glass production – impacts on the energy required to remelt recycled glass as compared to virgin glass production are neglected due to a lack of data.
It also includes the benefits and loads related to the energy recovery from plastic wastes in a MWIP as modelled in Modules A3, A5 and C3.
The benefits of the recycling of the motor and electronic parts are not considered due to the absence of data on its composition and recycled content.
Due to a lack of data for plastics from de-construction activities, the substitution potential of recycled plastics is not taken into account.
Only net flows leaving the product system are considered in module D.

5. LCA: Results

Disclaimer:

EP-freshwater: This indicator has been calculated as “kg P eq” as required in the characterization model (EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml)

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	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	ND	X	X	X	MNR	MNR	MNR	X	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 piece VELUX flat roof window CVP - grid-connected, 1.20 m x 1.20 m = 1.44 m2

Core Indicator	Unit	A1-A3	A5	B1	B2	B6	C1	C2	C3	C4	D
GWP-total	[kg CO_2-Eq.]	2.44E+2	9.23E+0	0.00E+0	5.83E+1	1.36E+2	0.00E+0	6.11E-1	2.97E+0	1.38E+2	-4.56E+1
GWP-fossil	[kg CO_2-Eq.]	2.51E+2	1.95E+0	0.00E+0	5.83E+1	1.36E+2	0.00E+0	6.11E-1	2.61E+0	1.38E+2	-4.56E+1
GWP-biogenic	[kg CO_2-Eq.]	-7.63E+0	7.27E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.60E-1	0.00E+0	0.00E+0
GWP-luluc	[kg CO_2-Eq.]	2.19E-1	8.66E-5	0.00E+0	2.00E-2	3.39E-1	0.00E+0	2.49E-4	1.96E-3	3.53E-2	-5.41E-2
ODP	[kg CFC11-Eq.]	5.69E-5	4.90E-8	0.00E+0	2.04E-6	6.88E-6	0.00E+0	1.43E-7	1.10E-7	1.18E-5	-3.16E-6
AP	[mol H^+-Eq.]	1.21E+0	1.35E-3	0.00E+0	2.21E-1	6.99E-1	0.00E+0	3.46E-3	6.92E-3	1.50E-1	-1.24E-1
EP-freshwater	[kg P-Eq.]	8.32E-3	1.65E-6	0.00E+0	1.52E-3	1.53E-2	0.00E+0	4.49E-6	2.25E-4	1.03E-3	-3.37E-3
EP-marine	[kg N-Eq.]	2.12E-1	5.05E-4	0.00E+0	1.13E-1	8.96E-2	0.00E+0	1.24E-3	2.25E-3	1.22E-1	-2.18E-2
EP-terrestrial	[mol N-Eq.]	2.29E+0	5.59E-3	0.00E+0	3.33E-1	1.04E+0	0.00E+0	1.37E-2	2.54E-2	4.07E-1	-2.53E-1
POCP	[kg NMVOC-Eq.]	7.38E-1	1.58E-3	0.00E+0	1.09E-1	2.83E-1	0.00E+0	3.92E-3	6.75E-3	1.20E-1	-7.86E-2
ADPE	[kg Sb-Eq.]	5.38E+2	7.18E-7	0.00E+0	4.30E-3	3.29E-4	0.00E+0	2.05E-6	3.11E-6	2.62E-4	-1.24E-4
ADPF	[MJ]	3.48E+3	3.21E+0	0.00E+0	2.38E+2	2.88E+3	0.00E+0	9.40E+0	2.43E+1	3.23E+2	-6.22E+2
WDP	[m^3 world-Eq deprived]	9.78E+1	1.31E-2	0.00E+0	9.36E+0	3.21E+1	0.00E+0	3.09E-2	1.11E-1	2.13E+1	-2.88E+0

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 piece VELUX flat roof window CVP - grid-connected, 1.20 m x 1.20 m = 1.44 m2

Indicator	Unit	A1-A3	A5	B1	B2	B6	C1	C2	C3	C4	D
PERE	[MJ]	1.81E+2	4.87E-2	0.00E+0	2.21E+1	5.46E+2	0.00E+0	1.33E-1	3.05E+0	2.85E+1	-5.68E+1
PERM	[MJ]	8.82E+1	-8.35E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-4.64E+0	0.00E+0	0.00E+0
PERT	[MJ]	2.69E+2	-8.35E+1	0.00E+0	2.21E+1	5.46E+2	0.00E+0	1.33E-1	-1.59E+0	2.85E+1	-5.68E+1
PENRE	[MJ]	3.27E+3	2.96E+1	0.00E+0	2.37E+2	2.90E+3	0.00E+0	9.40E+0	2.02E-5	1.19E+3	-6.29E+2
PENRM	[MJ]	8.92E+2	-2.64E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-8.65E+2	0.00E+0
PENRT	[MJ]	4.16E+3	3.21E+0	0.00E+0	2.37E+2	2.90E+3	0.00E+0	9.40E+0	2.02E-5	3.24E+2	-6.29E+2
SM	[kg]	1.78E+1	0.00E+0	0.00E+0	1.03E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-6.65E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m^3]	2.27E+0	6.44E-4	0.00E+0	1.46E-1	1.85E+0	0.00E+0	1.02E-3	6.46E-3	4.75E-1	-1.44E-1

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 piece VELUX flat roof window CVP - grid-connected, 1.20 m x 1.20 m = 1.44 m2

Indicator	Unit	A1-A3	A5	B1	B2	B6	C1	C2	C3	C4	D
HWD	[kg]	2.08E-2	8.48E-6	0.00E+0	4.22E-3	1.02E-3	0.00E+0	2.40E-5	2.02E-5	5.42E-4	2.35E-4
NHWD	[kg]	5.40E+1	2.31E-1	0.00E+0	3.41E+2	1.08E+1	0.00E+0	6.30E-1	5.23E-1	3.72E+2	-8.23E+0
RWD	[kg]	2.01E-2	4.57E-5	0.00E+0	1.83E-3	3.87E-2	0.00E+0	1.36E-4	2.19E-4	2.88E-3	-2.54E-3
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	8.97E+0	4.98E+0	0.00E+0	2.16E+0	0.00E+0	0.00E+0	0.00E+0	1.15E+1	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	1.12E+0	3.43E+0	0.00E+0	1.21E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.13E+2	0.00E+0
EET	[MJ]	2.11E+0	6.75E+0	0.00E+0	2.38E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.21E+2	0.00E+0

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 piece VELUX flat roof window CVP - grid-connected, 1.20 m x 1.20 m = 1.44 m2

Indicator	Unit	A1-A3	A5	B1	B2	B6	C1	C2	C3	C4	D
PM	[Disease Incidence]	9.20E-6	1.98E-8	0.00E+0	1.52E-6	1.79E-6	0.00E+0	5.49E-8	1.04E-7	1.50E-6	-1.07E-6
IRP	[kBq U235-Eq.]	6.32E+0	1.38E-2	0.00E+0	8.14E-1	2.62E+1	0.00E+0	4.08E-2	8.44E-2	1.37E+0	-1.05E+0
ETP-fw	[CTUe]	6.17E+3	3.74E+0	0.00E+0	1.97E+3	1.45E+3	0.00E+0	7.45E+0	1.94E+1	4.88E+3	-4.90E+2
HTP-c	[CTUh]	4.87E-7	3.16E-10	0.00E+0	1.05E-7	3.87E-8	0.00E+0	2.97E-10	4.54E-10	3.34E-8	-5.64E-8
HTP-nc	[CTUh]	5.60E-6	4.53E-9	0.00E+0	2.08E-6	1.26E-6	0.00E+0	8.57E-9	2.40E-8	1.27E-6	6.55E-8
SQP	[-]	9.26E+2	2.70E+0	0.00E+0	2.89E+2	4.42E+2	0.00E+0	8.02E+0	3.46E+0	2.76E+2	-7.06E+1

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”.This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

6. LCA: Interpretation

Figure 1 illustrates the relative contributions of the different modules along the life cycle of the declared products.

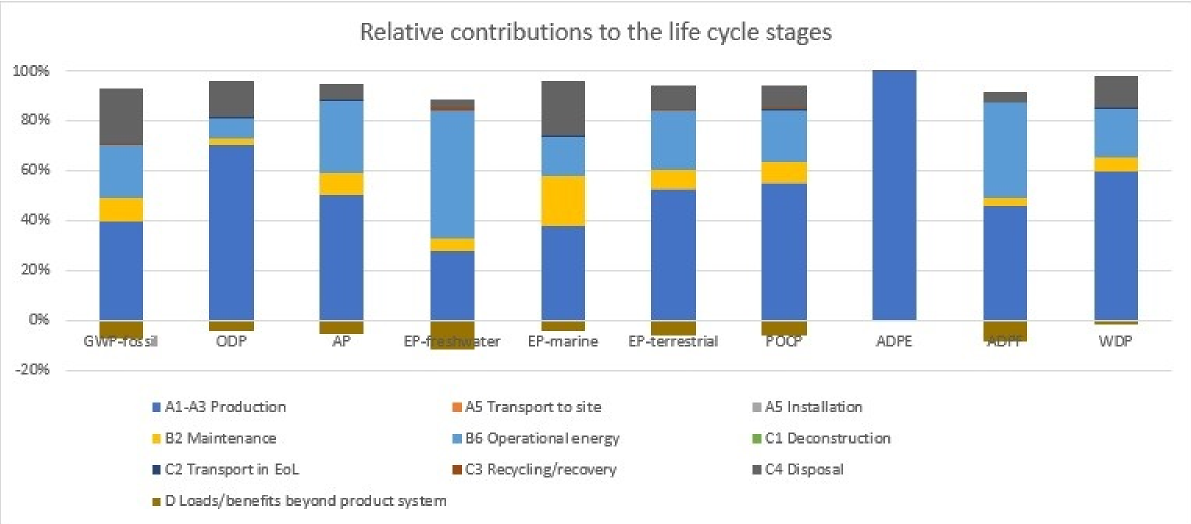

Figure 1: Relative environmental impacts of the different life cycle stages for the flat roof window CVP mains

The largest part of environmental impacts is caused during production (modules A1-A3) ranging from 31% to roughly 100%, and during the generation of operational energy (module B2) The relative contributions of these main drivers differs from one impact category to another.
Benefits and burdens beyond the system boundary (module D) are in the order of 0 % to 15% of the impacts over the product life cycle (modules A1-C4). [1]

The use of renewable primary energy is mainly caused by the share of renewable energy in the electricity mix, thus the production stage is the main drivers of this impact category; for the use of non-renewable primary energy, the operational energy (module B6) is the most impacting life cycle stage.
Material use of primary energy is negligible and related to plastic parts of the product and packaging material. The material use of primary energy is transferred to its energy use when the materials containing primary energy are incinerated with energy recovery.
Non-hazardous waste as the quantitatively most relevant waste flows is mainly caused during the production of the glass and during disposal of the

product; hazardous and radio-active wastes are mainly caused by the European electricity mix

[1] Benefits resulting from the recycling of plastics as well as from the recycling of the electronic parts are disregarded due to the lack of data on the recycling processes and related to the detailed composition of the electronic parts.

7. Requisite evidence

8.1 Formaldehyde
Not tested based on applicable product standard.

7.2 MDI
Not tested based on applicable product standard.

7.3 Checking of pre-treatment of substances used according to AltholzVO
Not applicable; not tested based on applicable product standard.

7.4. Fire gas toxicity
Not tested based on applicable product standard.

7.5 VOC emissions
Not tested based on applicable product standard.

8. References

Product category rules of IBU

IBU (2021)
IBU (2021): General Instructions for the EPD Programme of the Institut Bauen & Umwelt e.V. (General Instructions for the IBU EPD Programme). Version 2.0, Institut Bauen & Umwelt, Berlin

IBU (2017)
IBU (2017): PCR Teil A: PCR Part A: Calculation rules for the life cycle assessment and requirements for the project report. Version 1.8., Institut Bauen & Umwelt, Berlin.

IBU (2021)
IBU (2021):PCR Part B: Requirements on the EPD for windows and doors. Version 2021/01, Institut Bauen & Umwelt, Berlin.

Standards and legal documents

EN 15804
DIN EN 15804+A2:2019, Sustainability of construction works - Environmental product declarations - Core rules for the product category construction products.

ISO 14025
DIN EN ISO 14025:2006-07, Environmental labels and declarations - Type III Environmental declarations - Principles and procedures.

ISO 14044
DIN EN ISO 14044:2006-07, Environmental management - Life cycle assessment - Requirements and guidance (ISO 14044:2006); German and English versions EN ISO 14044:2006.

ISO 9001
DIN EN ISO 9001:2015, Quality management systems - Requirements.

ISO 14001
DIN EN ISO 14001:2015: Environmental management systems - Requirements with guidance for use.

ISO 45001
ISO 45001:2018-03, Occupational health and safety management systems - Requirements with guidance for use.

EN 1873
DIN EN 1873:2005, Prefabricated accessories for roofing - Individual rooflights of plastics - Product specification and test methods.

EN 12101-2
DIN EN 12101-2:2017-08, Smoke and heat control systems – Part 2: Specification for natural smoke and heat exhaust ventilators.

EN 16485
DIN EN 16485:2014-07, Round and sawn timber - Environmental Product Declarations - Product category rules for wood and wood-based products for use in construction; German version EN 16485:2014.

ECHA-List
The Candidate List of substances of very high concern, available via https://echa.europa.eu/nl/-/four-newsubstances-added-to-the-candidate-list.

Regulation on biocidal products
REGULATION (EU) No 528/2012 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 22 May 2012 concerning the making available on the market and use of biocidal products.

Regulation (EU) Nr. 305/2011(CPR)
REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

COUNCIL REGULATION (EU) No 333/2011
COUNCIL REGULATION (EU) No 333/2011 of 31 March 2011 establishing criteria determining when certain types of scrap metal cease to be waste under Directive 2008/98/EC of the European Parliament and of the Council.

European Waste List (Waste index)
http://www.gesetze-im-internet.de/avv/anlage.htm

Additional references

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