

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	VELUX Group
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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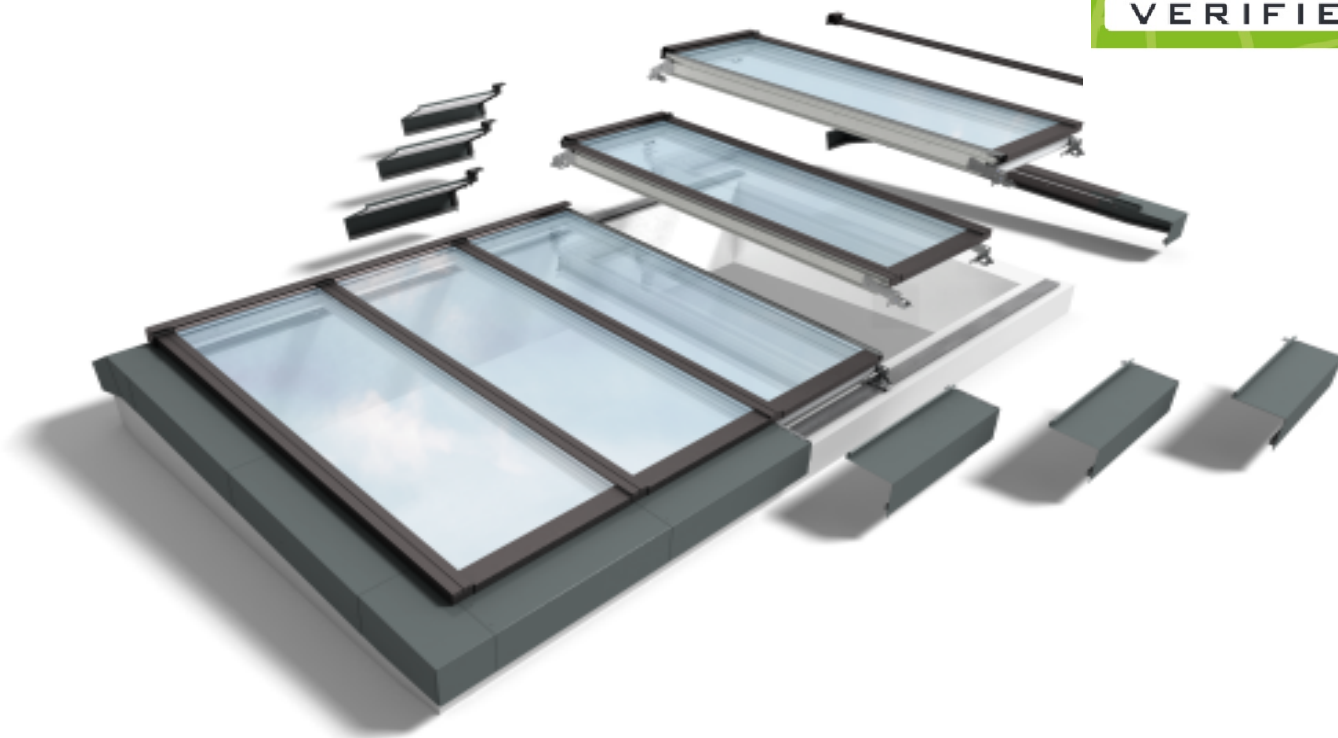
VELUX Modular Skylight (triple glazing configuration)
VELUX Group

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EPD
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General Information

<p>VELUX Group</p> <hr/> <p>Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-VEL-20210076-CC11-EN</p> <hr/> <p>This declaration is based on the product category rules: Windows and doors, 01.2021 (PCR checked and approved by the SVR)</p> <hr/> <p>Issue date 04/05/2021</p> <hr/> <p>Valid to 03/05/2026</p> <hr/>  <hr/> <p>Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)</p> <hr/>  <hr/> <p>Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.)</p>	<p>VELUX Modular Skylight (triple glazing configuration)</p> <hr/> <p>Owner of the declaration VELUX Group Ådalsvej 99 2970 Hørsholm</p> <hr/> <p>Declared product / declared unit The declared unit is a window of one square meter (m²) with triple glazing configuration. The declared unit is based on the configuration of a standard size window measuring 1.23 m * 1.48 m.</p> <hr/> <p>Scope: The EPD is a representative EPD covering VELUX Modular System (VMS) products. The products are manufactured by VELUX Group in Østbirk, Denmark for sale throughout Europe.</p> <p>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. The EPD was created according to the specifications of <i>EN 15804+A2</i>. In the following, the standard will be simplified as <i>EN 15804</i>.</p> <hr/> <p>Verification</p> <table border="1"> <tr> <td colspan="2">The standard <i>EN 15804</i> serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration and data according to <i>ISO 14025:2010</i></td> </tr> <tr> <td><input type="checkbox"/> internally</td> <td><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/>  <hr/> <p>Juliane Franze (Independent verifier)</p>	The standard <i>EN 15804</i> serves as the core PCR		Independent verification of the declaration and data according to <i>ISO 14025:2010</i>		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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Independent verification of the declaration and data according to <i>ISO 14025:2010</i>							
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Product

Information about the enterprise

For 80 years, the VELUX Group has created better indoor environments by bringing daylight and fresh air into homes and other buildings all over the world. The VELUX Group was founded in Denmark and is today an international company with a presence in 40 countries.

Product description/Product definition

VELUX Modular Skylights (VMS) are sash-frame constructed single roof windows. The modules fit together and can be configured in several predefined daylight solutions. All individual skylights are delivered as prefabricated modules with dedicated factory finished flashings to ensure watertightness in every solution.

The VMS include modules, which can be opened (venting) as well as modules, which cannot be opened (fixed). The EPD covers VMS modules in sizes from 0.405 m² up to 2.3 m².

The glass panes are with triple glazing and different glass configurations are covered by the EPD. The glass thickness ranges from 18 to 22 mm. Some glass panes have cavities filled with Argon gas others with Krypton. The representative glass configuration used for the EPD calculations has 8 mm toughened glass, 12 mm space, 4 mm toughened glass, 12 mm space and 10 mm laminated glass. This configuration is conservative with regards to the environmental impact results.

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 14351-1:2006+A2:2016*, Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets. For the application and use, the respective national provisions apply.

Application

VELUX Modular Skylight consists of modules, that are built together to form a long band of window modules in several predefined solutions such as a longlight or ridgelight. The length of the band of modules is determined by the need of the individual building.

Technical Data

The Declaration of Performance including relevant technical specifications and test methods/test standards can be downloaded from the webpage www.velux.com/ce-marking.

The performance values are specific for the specific VMS variants covered by the EPD.

The declared values in below table relate to the reference product incl. the pane variant 16T. For other VMS product variants, specific values can be selected at the bottom of the above-mentioned download page.

Constructional data (Reference product incl. pane variant 16T)

Name	Value	Unit
Fire resistance class § 4.4.1	B-s1.d0	class
Air permeability , § 4.14	4	class
Resistance to wind load, § 4.2 (for window width >1000 mm or height > 2400 mm no performance is determined)	C5	class
Resistance to snow loads, § 4.3	8 mm toughened -12 mm- 4 mm heat strength ened 12 mm - 10.76 mm (55.2) laminate d heat strength ened	mm

Watertightness, § 4.5	E1200	class
Impact resistance, § 4.7 (for window width >550 mm or height > 778 mm no performance is determined)	test is passed	-
Load bearing capacity of safety devices, § 4.8	test is passed	-
Acoustic performance, § 4.11	38 (-1; -4)	-
Thermal transmittance, § 4.12 , 90 degree installation acc. to EN 10077-1/2	1,1	W/(m ² (K))
Solar factor, § 4.13	0.50	-
Light transmittance, § 4.13	0.71	-

Product performance data in accordance with *DS/EN 14351-1:2006+A2:2016*, Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets.

Base materials/Ancillary materials

Name	Value	Unit
Glass pane	75	%
Composite frame of glass fibre reinforced polyurethane	14	%
Metals	8	%
Other materials	3	%

Reference service life

No reference service life (RSL) is defined for the VMS products because the use stage modules are not included in the EPD.

LCA: Calculation rules

Declared Unit

Multiple product dimensions are represented by this EPD as specified in the product description.

The declared unit is 1 m² window calculated based on one representative window module measuring 1.23 m * 1.48 m (reference window based on *EN 14351-1*) with triple glazed window panes.

Declared unit

Name	Value	Unit
Conversion factor to 1 kg	67.2	-
Declared unit	1	m ²

A data quality and a sensitivity analysis shows that the results are robust with regards to data quality and appropriateness. There is low variability of production processes and product variations have a limited influence on the results. This also applies with regards to the size of the windows where larger sizes have

slightly lower environmental impacts compared with smaller sizes and the other way around.

System boundary

Type of EPD: Cradle to gate - with options. The following life cycle phases were considered:

Product stage:

- A1 - Raw material extraction and processing: production of the pre-products (e.g. glass pane profiles, covers, brackets, sealant...) and packaging components (primarily wood)
- A2 - Transport to the manufacturer: Transport of pre-products and packaging components to the manufacturing site

- A3 - Manufacturing: The composite profiles for the products are produced at VELUX production site in Grindsted in Denmark in a pultrusion process. The final assembly and production of the VMS modules takes place at the VELUX production site in Østbirk in Denmark. The final production processes include shortening of profiles, drilling of holes, clamping and glueing, mounting of gaskets, brackets, panes etc. as well as stacking on pallets.

- C3 - Waste processing: sorting of glass waste, incineration of plastic and rubber parts
- C4 - Disposal: disposal of all materials

Benefits and loads beyond the system boundaries:

- D - Reuse, recovery and recycling potential: benefits from plastic incineration processes and recycling of metal and glass. For details, see scenario information under “Scenarios and additional technical information”.

End of life stage:

- C1 - De-construction: de-construction of the window with the use of a screwdriver
- C2 - Transport: transport of window materials to incineration and recycling

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.

The background database used is GaBi..

LCA: Scenarios and additional technical information

Characteristic product properties

Information on biogenic Carbon

2.3 kg wood packaging is used per declared unit. This is the only biogenic material used.

Information describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic Carbon Content in product	0	kg C
Biogenic Carbon Content in accompanying packaging	1	kg C

materials. Secondary materials in the VMS modules do not substitute primary materials in the end-of-life scenario. The recycled glass is used as container glass in the end-of-life scenario.

Name	Value	Unit
Glass recycled	30	%
Metal recycled	95	%
Plastic incinerated with energy recovery	95	%

The construction process stage and the use stage modules are not declared. However, the quantity of packaging generated in module A5 is declared as scenario information.

Installation into the building (A5)

Name	Value	Unit
Wood packaging for waste treatment	2.3	kg
Plastic packaging for waste treatment	0.07	kg
Metal screws for waste treatment	0.02	kg

End of life (C1-C4)

Name	Value	Unit
Collected as mixed construction waste	105	kg
Recycling	31	kg
Energy recovery	3	kg
Landfilling	71	kg

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

The recycling efficiency for all materials is maximum 90% in accordance with *EN 17213*. This means that only 90% of the recycled materials substitute primary

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	ND	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m2 VMS with triple glazing

Core Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ -Eq.]	1.87E+2	4.50E+0	3.93E+0	1.85E-3	1.19E-1	3.49E+0	1.32E+0	-2.75E+1
GWP-fossil	[kg CO ₂ -Eq.]	1.87E+2	4.47E+0	7.80E+0	1.84E-3	1.18E-1	3.49E+0	1.38E+0	-2.75E+1
GWP-biogenic	[kg CO ₂ -Eq.]	1.95E-1	-7.62E-3	-3.88E+0	6.14E-6	-2.01E-4	1.03E-3	-6.44E-2	-3.13E-2
GWP-luluc	[kg CO ₂ -Eq.]	4.41E-2	3.61E-2	1.16E-2	2.67E-6	9.55E-4	1.24E-4	3.21E-3	-8.53E-3
ODP	[kg CFC11-Eq.]	8.71E-8	5.36E-16	3.61E-9	4.05E-17	1.42E-17	1.63E-8	3.61E-15	-3.67E-14
AP	[mol H ⁺ -Eq.]	1.37E+0	1.47E-2	1.21E-2	4.07E-6	3.89E-4	2.32E-3	6.44E-3	-1.39E-1
EP-freshwater	[kg PO ₄ -Eq.]	5.40E-2	1.36E-5	4.36E-5	4.92E-9	3.58E-7	3.93E-5	1.30E-4	-1.28E-5
EP-marine	[kg N-Eq.]	3.90E-2	6.67E-3	4.27E-3	9.04E-7	1.76E-4	9.76E-4	1.67E-3	-3.18E-2
EP-terrestrial	[mol N-Eq.]	4.15E-1	7.46E-2	4.44E-2	9.49E-6	1.97E-3	1.14E-2	1.84E-2	-3.58E-1
POCP	[kg NMVOC-Eq.]	1.87E-1	1.30E-2	1.13E-2	2.48E-6	3.44E-4	2.58E-3	4.95E-3	-7.49E-2
ADPE	[kg Sb-Eq.]	2.42E-3	3.20E-7	6.64E-6	5.33E-10	8.45E-9	1.36E-7	1.06E-7	-8.81E-6
ADPF	[MJ]	2.80E+3	5.94E+1	9.79E+1	3.24E-2	1.57E+0	2.61E+0	1.90E+1	-3.45E+2
WDP	[m ³ world-Eq deprived]	4.28E+0	3.99E-2	-5.56E-2	4.02E-4	1.05E-3	4.00E-1	4.97E-2	-2.03E+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 m2 VMS with triple glazing

Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
PERE	[MJ]	5.87E+2	3.34E+0	9.14E+1	1.44E-2	8.82E-2	2.52E-1	1.74E+0	-5.84E+1
PERM	[MJ]	0.00E+0	0.00E+0	3.92E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	5.87E+2	3.34E+0	1.31E+2	1.44E-2	8.82E-2	2.52E-1	1.74E+0	-5.84E+1
PENRE	[MJ]	3.11E+3	5.95E+1	9.51E+1	3.24E-2	1.57E+0	7.69E+1	1.90E+1	-3.45E+2
PENRM	[MJ]	1.52E+2	0.00E+0	2.83E+0	0.00E+0	0.00E+0	-7.43E+1	0.00E+0	0.00E+0
PENRT	[MJ]	3.26E+3	5.95E+1	9.79E+1	3.24E-2	1.57E+0	2.61E+0	1.90E+1	-3.45E+2
SM	[kg]	3.30E+0	0.00E+0	2.32E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	2.33E-12	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	2.74E-11	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m ³]	8.05E+2	3.87E-3	4.07E-2	1.66E-5	1.02E-4	9.41E-3	2.02E-3	-1.50E-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 m2 VMS with triple glazing

Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
HWD	[kg]	5.26E-3	2.77E-6	2.17E-7	1.34E-11	7.31E-8	1.61E-9	2.28E-7	-2.79E-7
NHWD	[kg]	7.19E+1	9.10E-3	3.44E-1	2.30E-5	2.40E-4	4.56E+1	4.53E+1	-3.91E+0
RWD	[kg]	2.08E-1	7.36E-5	3.33E-3	4.92E-6	1.94E-6	3.76E-5	2.05E-4	-1.12E-2
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
MFR	[kg]	7.51E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.01E+1	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.43E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.29E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.13E+1	0.00E+0	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; EEE = Exported thermal energy

**RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 m2 VMS with triple glazing**

Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
PM	[Disease Incidence]	2.03E-6	7.92E-8	5.93E-7	3.41E-11	2.09E-9	1.47E-8	7.11E-8	-1.15E-6
IR	[kBq U235-Eq.]	3.92E+0	1.06E-2	3.52E-1	8.07E-4	2.81E-4	2.52E-2	2.59E-2	-2.15E+0
ETP-fw	[CTUe]	4.62E+2	4.20E+1	2.56E+1	1.39E-2	1.11E+0	1.52E+0	1.54E+1	-2.86E+2
HTP-c	[CTUh]	3.21E-7	8.80E-10	4.90E-8	3.83E-13	2.32E-11	6.76E-11	1.08E-9	-1.54E-8
HTP-nc	[CTUh]	1.29E-6	5.16E-8	5.12E-8	1.41E-11	1.36E-9	2.79E-9	1.04E-7	-2.52E-7
SQP	[-]	1.31E+2	2.08E+1	1.09E+3	1.03E-2	5.51E-1	2.36E+0	2.81E+0	-1.49E+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 IRP. 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 nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators ADPE, ADPF, WDP, ETP-fw, HTP-c, HTP-nc, SQP. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

References

EN 14351-1

EN 14351-1:2006+A2:2016, Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets.

EN 15804

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

EN 17213

EN 17213:2020: "Windows and doors – Environmental Product Declarations – Product category rules for windows and pedestrian doorsets".

IBU PCR Part A

IBU PCR Part A: Institut Bauen und Umwelt e.V., Product Category Rules for Building-Related Products and Services. Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019.

ISO 10077-1

ISO 10077-1:2017, Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 1: General.

ISO 10077-2

ISO 10077-2:2017, Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 2: Numerical method for frames.

ISO 14025

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

Regulation (EU) No. 305/2011

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.

GaBi LCA software and database

The LCA modelling software is GaBi program version 9.5.2.49 with corresponding databases from Sphera Solutions GmbH. Documentation hyperlink www.gabi-software.com/support/gabi.

IBU 2016

Institut Bauen und Umwelt e.V.: General Programme Instructions for the Preparation of EPDs at the Institut Bauen und Umwelt e.V. Version 1., Berlin: Institut Bauen und Umwelt e.V., 2016. Hyperlinks: <http://www.ibu-epd>, www.ibu-epd.com.

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