

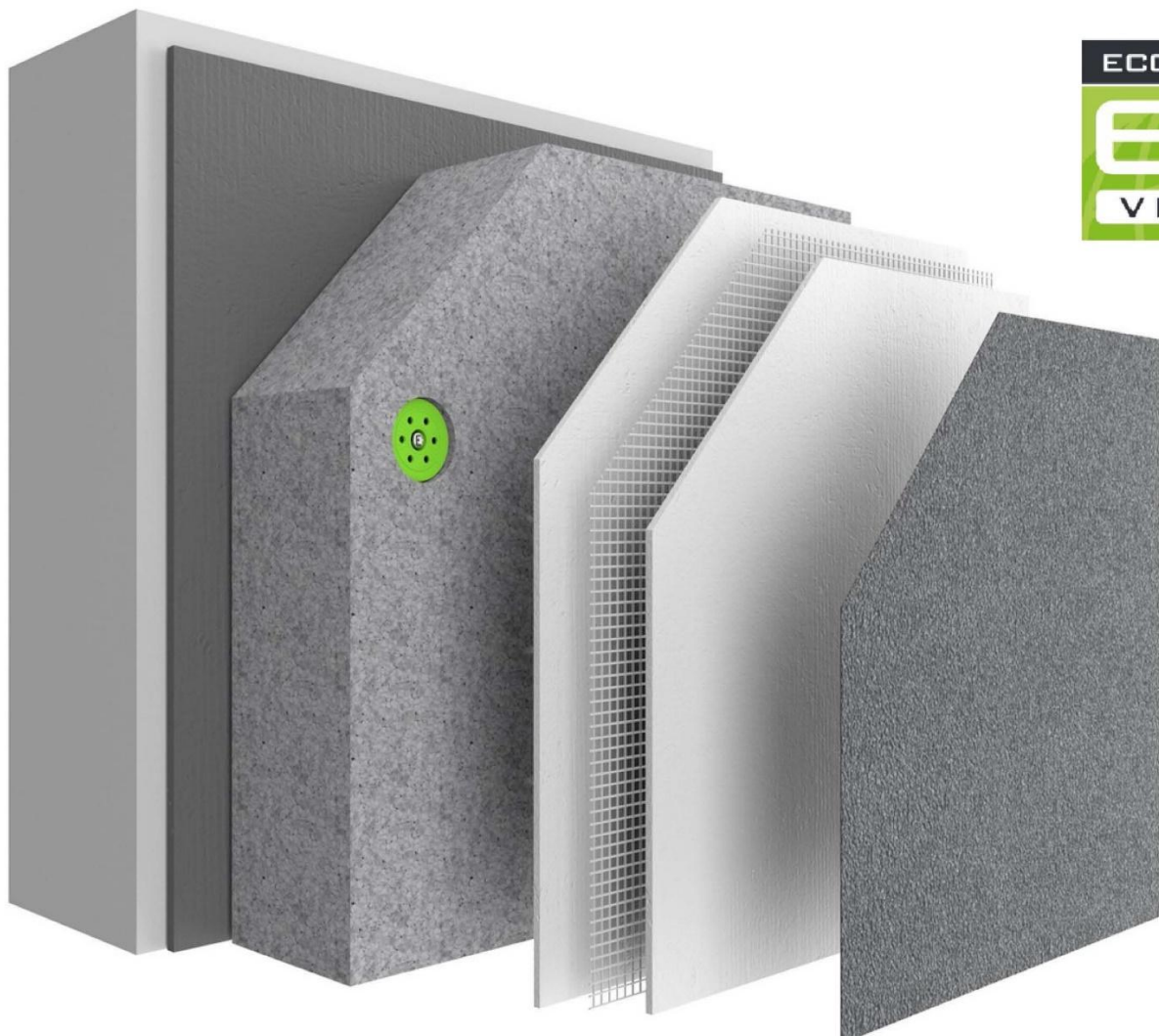
# ENVIRONMENTAL PRODUCT DECLARATION

according to ISO 14025 and EN 15804+A2

Owner of declaration	Verband für Dämmsysteme, Putz und Mörtel e.V.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration no.	EPD-WDV-20240371-IBP1-DE
Date of issue	09/01/2025
Valid until	08/01/2030

**WDVS with EPS insulating board glued and dowelled**  
**Verband für Dämmsysteme, Putz und Mörtel**  
**e.V.**

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## 1. General information

### Verband für Dämmsysteme, Putz und Mörtel e.V.

#### Programme holder

IBU – Institut Bauen und Umwelt e.V.  
Hegelplatz 1  
D-10117 Berlin  
Germany

#### Declaration no.

EPD-WDV-20240371-IBP1-DE

#### This declaration is based on the product category rules:

Thermal insulation composite systems, 01 Aug 2021  
(PCR tested and approved by the Independent Board of Experts (SVR))

#### Date of issue

09/01/2025

#### Valid until

08/01/2030



Dipl.-Ing. Hans Peters  
(Chairman of the Institut Bauen und Umwelt e.V.)



Florian Pronold  
(Managing director of the Institut Bauen und Umwelt e.V.)

### WDVS with EPS insulating board glued and doweled

#### Owner of declaration

Verband für Dämmsysteme, Putz und Mörtel e.V.  
Reinhardtstraße 14  
D-10117 Berlin  
Germany

#### Declared product / Declared unit

1 m<sup>2</sup> thermal insulation composite system, 160 mm insulating material thickness with 0.031 to 0.035 W/(mK)

#### Scope:

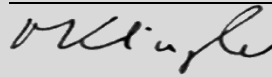
Thermal insulation composite systems (WDVS) consist of a number of different components/precursor products which in turn have a verified EPD. This document is a model EPD in which the life cycle assessment of the individual component EPDs with the highest environmental burdens (worst case) for adhesives, rendering coat and finishing coat was calculated; generic data was used for the insulating material. It exclusively covers thermal insulation composite systems for members of the association (see the association's website). The figures, such as structural or concentration data, reflect the usual, average practical figures.

The owner of the declaration is liable for the underlying information and supporting documents; any liability of IBU regarding the manufacturer's information, life cycle assessment data, and supporting documents is excluded.

The EPD was drawn up in accordance with EN 15804+A2. The standard will simply be referred to as *EN 15804* herein.

#### Verification

The European standard EN 15804 is the core PCR	
Independent verification of the declaration and information according to ISO 14025:2011	
<input type="checkbox"/>	internal
<input checked="" type="checkbox"/>	external



Matthias Klingler,  
(Independent verifier)

## 2. Product

### 2.1 Product description/Product definition

Thermal insulation composite system with glued-on and dowelled polystyrene hard foam (EPS) insulating board consisting of adhesive, EPS insulating board, dowels, reinforcement fabric, rendering coat, and finishing coat. Since only a draft standard (*prEN 17237*) and no European harmonised standard existed as of the date of the EPD, systems in Germany must either have a general regulatory approval/general type approval issued by DIBt, Berlin Z-33. YY-XXXX or a European technical assessment *ETA nn/nnnn* with a manufacturer's declaration or a declaration of performance in consideration of the *EOTA EAD* and *CE label*.

The making available on the market of the product within the EU/EFTA (excluding Switzerland) is subject to the provisions of *Regulation (EU) No 305/2011/ (CPR)*.

The use of the product is governed, in each case, by the regulations applicable at the site of use, these being the applicable state building codes in Germany.

The WDVS under consideration has an outer surface consisting of a coat layer because coated WDVS is the most common type. As an alternative, WDVS may also use hard coats and other coating.

### 2.2 Application

The purpose of thermal insulation composite systems is to afford protection and thermal insulation for exterior walls of new and existing structures.

Thermal insulation composite systems are applied to masonry and concrete with or without coat on standardised substrates or substrates with general regulatory approvals in the domain of wood construction to provide protection and thermal insulation and save energy for buildings. Thermal insulation composite systems can also be used for cross lamination, subject to building supervisory requirements.

### 2.3 Technical data

Constructional data may vary depending on the product and manufacturer; the performance range must not be exceeded.

**Constructional data (specification of the applicable threshold values and/or requirements)**

Designation	Value	Unit
Water absorption acc. to EOTA EAD or EN 1062-3	≤ 0.5 or ≤ 1.0	kg/m <sup>2</sup>
Hygrothermal behaviour (EOTA value)	See EOTA EAD performance requirements	-
Freezing-thawing behaviour acc. to EOTA EAD	See EOTA EAD performance requirements – only needed for water absorption ≥ 0.5 kg/m <sup>2</sup>	-
Impact resistance acc. to EOTA EAD	Use categories I/ II/ III	-
Bond strength between rendering coat and thermal insulating material acc. to EOTA EAD	≥ 80 or failure in insulating material; testing carried out on weathered EOTA wall	kPa
Bond strength between adhesive and substrate acc. to EOTA EAD	≥ 250 when dry, ≥ 80 after water storage, ≥ 250 after redrying	kPa
Bond strength between adhesive and thermal insulating material acc. to EOTA EAD	≥ 80 when dry, ≥ 30 after water storage, ≥ 80 after redrying	kPa
Bond strength after ageing acc. to EOTA EAD	≥ 80	kPa
Resistance to wind loads (requirements as per EN 1991-1-4 / EN 1991-1-4/NA)*		-
WDVS thermal insulation resistance acc. to EN 12667 / EN 12939 **	5.19	m <sup>2</sup> K/W

\*) Depends greatly on structure and site, no universal specification possible

\*\*) Value allows for WDVS (EPS 031) without including the wall material

Classification acc. to *PCR Teil A*: declaration of a typical or representative product which describes a specific product.

### 2.4 Delivery condition

Dimensions and quantities must comply with the general building supervisory approval/general type approval Z-33. YY-XXXX or the European Technical Assessment *ETA nn/nnnn*.

### 2.5 Base materials /

#### Accessory materials

##### precursors:

The data of the precursor products/system components are detailed in the individual manufacturer EPDs, and should be gathered from there. The following system components are used:

##### Adhesive:

Adhesive and rendering coat formulated with organic binding agent *EPD-VDL-20190057-IBG1-DE*

##### Insulating board:

Generic data sets included in the software *Sphera LCA FE*, Managed LCA Content (MLC) database

**Dowels:**

Dowels *EPD-EJO-20210060-IBD1-DE*

**Reinforcement fabric:**

Glass reinforcement fabric *EPD-VIT-20220104-IAC1-DE*

**Rendering coat:**

Adhesive and rendering coat formulated with organic binding agent  
*EPD--VDL-20190057-IBG1-DE*

**Finishing coat:**

Dispersion coating *EPD-VDL-20190056-IBG1-DE*

This model EPD applies where the following components are used with the corresponding mass fractions:

Adhesive organic: 5.0 kg/m<sup>2</sup>

Insulating board EPS: 2.4 kg/m<sup>2</sup> (160 mm)

Dowels: 0.285 kg/m<sup>2</sup>

Reinforcement fabric: 0.176 kg/m<sup>2</sup>

Rendering coat organic: 3.0 kg/m<sup>2</sup>

Finishing coat organic (dispersion coating) 3,0 kg/m<sup>2</sup>

**Auxiliary materials and additives:**

This system uses no auxiliary materials and additives.

**Material note:**

Material notes can be found in the system components' EPDs.

**Raw materials production and materials origin:**

Information on the origin of the raw materials and materials can be found in the EPDs.

**Raw materials availability:**

Information on raw materials availability can be found in the individual EPDs.

Information on specific ingredients:

The product contains substances according to the *ECHA List of 22 April 2024* at levels above 0.1 mass percent: no.

The product/at least one partial product contains additional, category 1A or 1B, CMR substances not included in the *candidate list*, at levels above 0.1 mass percent in at least one partial product: no.

The construction product in question has biocides added or was treated with biocidal products (making it a treated good in the meaning of *Regulation (EU) No 528/2012* (Biocidal Products Regulation): no.

Individual WDVS components may be treated products within the meaning of art. 58 of *Regulation (EU) No 528/2012* (Biocidal Products Regulation). Biocides under PT 6 (pot preservatives) and PT 7 (film preservatives) may be used.

Pot preservatives: bis(3aminopropyl)(dodecyl)amine (BDA); benzisothiazolinone (BIT); bronopol (BNPD); methylchloroisothiazolinone (CIT); methylchloroisothiazolinone (CIT) / methylisothiazolinone (MIT) 3:1; dibromodicyanobutan (DBDCB); (ethylendioxy)dimethanol (EDDM); 3iodine2propinylbutylcarbamate (IPBC); methylisothiazolinone (MIT); sodium pyrithione; silver chloride; tetramethylolacetylendiurea (TMAD); zinc pyrithione. Film preservatives: diurone (DMCU), isoproturone, terbutryn, dichlorooctylisothiazolinone (DCOIT), octylisothiazolinone (OIT), iodopropynylbutylcarbamate (IPBC), zinc pyrithione.

**2.6 Assembly**

The thermal insulation composite system is assembled on site. The systems are not pre-assembled in the factory.

**2.7 Environment and health during production**

The manufacturer's instructions in the technical information sheet and *EC Safety Data Sheet* of the individual system components must be complied with. The hazardous substances information system of the occupation co-operative *GISBAU* must be observed. The aqueous, organically bound precursor products contain film binding auxiliary agents which are released into the atmosphere during the drying process. No other hazardous substances are known.

**2.8 Product processing/Installation**

The technical guideline for the planning and processing of thermal insulation composite systems as per *BFS Merkblatt Nr. 21* and *DIN 55699*, the manufacturers' processing instructions, the constructional prerequisites (see. *BFS Merkblatt Nr. 21*), and the marginal conditions defined in the applicable general building supervisory approval/general type approval *Z-33.YY-XXXX* or European Technical Assessment *ETA nn/nnnn* must be complied with.

The wall surface must be sufficiently smooth, dry and free of fat and dust, and must have a minimum tear strength of 0.08 N/mm<sup>2</sup>. The adhesive must be applied to the rear of the board or to the substrate. The torus-point method has been found to be suitable. Full-surface gluing is only recommendable for flat substrates. The adhesive surface must exceed 40% when pressed on. The insulation boards must be mounted within the surface as an assembly and serrated at the corners of the structure. Bumps up to 1 cm/m can be offset with the adhesive bed. The insulating boards are to be fitted without offset and level. Offsets at the joints must be feather edged.

The adhesive should be cured when the dowels are inserted. The amount of dowels to be used and their two-dimensional distribution is subject to the Site, the ground profile, the individual sections of surface, the building dimensions, and the wind flow direction acc. to *EN 1991* (also see *Rosemeier*). This means that specific data can only be given for specific structures. 0.285 kg/m<sup>2</sup> of dowels were taken as a basis for this EPD.

After the adhesive has solidified and the dowels have been mounted, the rendering coat is applied manually or mechanically to the insulating boards to a sufficient thickness. The fabric is incorporated in such a way that it rests centrally in the rendering coat. The fabric joints must overlap approx. 10 cm. Once the reinforced rendering coat has set, dried, and become able to take a load, the finishing coat can be applied and textured. The luminosity of the finishing coat should typically not be below 20.

**2.9 Packaging**

An average packaging of the WDVS will be considered. The downstream processing of the packaging is part of the system boundaries.

**2.10 Condition in use**

With time, the system's surface will soil and weather due to climatic and environmental factors. Therefore, maintaining the system on a regular basis, e.g. by painting, will help improve the visual appearance and *service life* (*WTA-MB 2-13*).

**2.11 Environment and health during use**

Finishing coats with dispersion binding agents can be preserved with biocides against microbial attack for the duration of the use phase.

Façade areas exposed to rain will typically start to bleed the components of the biocidal protective treatment after a few years.

The bleeding of hazardous substances from building products into the soil and the ground and surface water is currently horizontally standardised in *CEN TC 351/WG1*. The vertical (product-specific) standardisation of the constructional coating is carried out in *CEN TC 139/WG 10*. Informed statements as to the effects of this bleeding from finishing coats are not yet possible at this juncture. However, only approved biocides which were tested as part of the approval procedure for their effects and bleeding behaviour are used, and only in approved concentrations, as per *Regulation (EU) No 528/2012*. Details of the ingredients used in each WDVS system component can be found in the corresponding *EC Safety Data Sheet* of the respective manufacturer.

### 2.12 Reference service life

Duration of the service life principally depends on workmanship (*BFS-Merkblatt Nr. 21* and *DIN 55699*), with the design and execution of connections to other buildings or building components which are resistant to driving rain being of critical importance. Construction work with WDVS can be kept damage-free by avoiding mistakes in these life cycle phases and using it as intended (*Cziesielski/Vogdt*). There are more than 50 years of experience with thermal insulation composite systems. A reference service life (RSL) acc. to *ISO 15686-1*, -2, -7 and -8 is not declared. Experience shows that WDVS has a service life of 50 years or more (*BBSR*), when used as intended. When properly and professionally maintained on a regular basis, the systems may have an even longer service life (*IBP-Bericht HTB 005/2023*).

### 2.13 Exceptional influences fire

Glued and dowelled thermal insulation composite systems with EPS insulating boards are classified under *DIN 4102-1* as flame-resistant and placed in construction material category B1. This is equivalent to the category B-s1, d0 acc. to *EN 13501-1*. System-specific fire protection measures must be observed when installing thermal insulation composite systems.

### Fire protection

Designation	Value
Construction material category acc. to EN 13501-1	B
Flue gas formation acc. to EN 13501-1	s1
Formation of burning drops acc. to EN 13501-1	d0

### Water

Damage caused by brief exposure of a thermal insulation composite system to high water can be repaired by drying, as long as the wall material remains intact.

### Mechanical destruction

Mechanical destruction will impair the durability and function of the system. Destroyed sections may be restored, subject to their nature and size; this may enable the application of a fresh finishing coat over the full length of the façade.

### 2.14 End-of-life phase

Thermal insulation composite systems are either shredded and disposed or selectively deconstructed; the EPS insulating material, together with any deposits, will be thermally utilised for energy production, and the remainder will be sent to landfill. Methods of material utilisation (recycling) of WDVS with EPS insulating materials are known, and their execution was examined in pilot plants/field laboratories (e.g., *CreaSolv* oder *PS-Loop*) and is possible at industrial scales.

### 2.15 Disposal

EPS insulants no longer use the flame retardant HBCD (hexabromocyclododecane). The EPD covers EPS insulants containing polymeric flame retardants (polymer-FR). These can be sent to landfill. The EAK Waste Code under the Waste Index Ordinance (WIO) for the insulating material is 170604 and 170603\*, respectively (waste identification: insulating material) and 170904 and 170903\*, respectively, for the other materials (waste identification: mixed and/or other building and demolition waste).

### 2.16 Additional information

Additional information on thermal insulation composite systems can be found in the respective manufacturer's declaration of performance and online at: [www.vdpm.info](http://www.vdpm.info).

## 3. LCA: calculation rules

### 3.1 Declared unit

The declaration is based on the life cycle of thermal insulation composite system.

#### Declared unit

Designation	Value	Unit
Declared unit	1	m <sup>2</sup>
Mass per unit area	13.9	kg/m <sup>2</sup>
Layer thickness incl. adhesive and coating	0.17	m
Heat transfer coefficient (U value) of the thermal insulation composite system (EPS 031) – without wall material	0.19	W/(m <sup>2</sup> K)

Other declared units are permitted as long as the conversion is made transparent.

### 3.2 System boundary

EPD type: cradle to factory gate – with options, i.e. modules C1-C4 and module D (A1-A3, C, D and additional modules: A4, A5, B1).

The EPD covers the following life cycle stages:

- Product stage (A1-A3)
- Building construction stage (A4-A5)
- Usage stage (B1)
- Disposal stage (C1-C4)
- Use potentials and burdens outside the system boundaries (D)

#### Module A1-A3

A WDVS consists of different components, all of which are manufactured separately and assembled into a WDVS at the construction site.

The system boundaries for WDVS production are drawn up to production and provision of the system components.

The EPD environmental results (modules A1-A3) of the individual components are used to calculate the WDVS EPD. In addition to the energy and raw materials used, these already include raw material transport, expenditures for packaging materials, and post-industrial waste treatment, if applicable. Valid EPDs are available for all materials.

### Building construction stage (A4-A5)

Module A4: This module allows for 100 km road transport to the site of installation (diesel truck, EURO 6, 40 tonnes total load, 61% degree of capacity utilisation). The transport route can be adjusted as needed for the project by linear scaling.

Module A5: Power consumed during installation (mainly by hand-held equipment) was accounted for (7.58 MJ/m<sup>2</sup>). Treatment and disposal of packaging material. Credits for possible burdens avoided by energetic substitution of power and heat generation are declared in module D; they are specific to the portion of primary material employed (no secondary materials).

### Module B1

Carbonation is factored in accordance with VDPM Mortar EPDs for mineral plasters.

### Modules C1-C4 and module D

Module C1: mechanical deconstruction (excavator)

Module C2: 50 km transport by diesel truck, EURO 6, total load 40 tonnes, 61% degree of capacity utilisation

Module C3: waste processing of overall system (e.g., shredding, sorting) and thermal treatment of high-calorific insulating materials (EPS and wood fibre insulating material) in refuse incinerators (RI) (R1>0.6);

Module C4: disposal of the remaining materials;

Module D: credits for substitution of electric and thermal energy extracted from natural gas (EU mix) during packaging and insulating materials recycling.

### 3.3 Estimates and assumptions

Raw materials transport (various components) to the factory (A2) is assumed to be 300 km.

For disposal transports, 50 km is assumed as a typical distance.

The study requires no additional estimates. Where applicable, estimates will be given in individual EPDs of the WDVS components.

### 3.4 Cut-off rules

No cut-off rules are applied to the WDVS components; all required WDVS materials are considered. The data is chiefly based on EPDs so that the procedure as to cut-off criteria can be gathered from the individual EPDs of the WDVS components.

### 3.5 Background data

The LCA For Experts *Sphera LCA FE* (previously GaBi) software, version 10.7 was used to model the life cycle of the declared product. The underlying database is *Sphera Managed LCA Content*, CUP version 2023.1.

For this project, generic datasets were used for the following system components:

- Mineral wool MW (insulating material thickness 160 mm, bulk density 125 kg/m<sup>3</sup>)
- Wood fibre WF (insulating material thickness 160 mm, bulk density 180 kg/m<sup>3</sup>)
- EPS (insulating material thickness 160 mm, bulk density 15 kg/m<sup>3</sup>)

For this project, data sets based on existing VDPM models were used for the following system components:

- Adhesive mortar, based on EPD No. *EPD-VDP-20230401-IBO1-DE*
- Mineral rendering coat, based on EPD No. *EPD-VDP-20230398-IBO1-DE*
- Organic rendering coat, based on EPD No. *EPD-VDP-20230401-IBO1-DE*
- Organic finishing coat, based on EPD No. *EPD-VDP-20230398-IBO1-DE*

For this project, data sets based on published EPD models were used for the following system components:

- Organic adhesive mortar, based on EPD No. *EPD-VDL-20190057-IBG1-DE*
- Organic rendering coat, based on EPD No. *EPD-VDL-20190057-IBG1-DE*
- Reinforcement fabric, based on EPD No. *EPD-VIT-20220104-IAC1-DE*
- Coupling agent, based on EPD No. *EPD-VDL-20190052-IBG1-DE*
- Organic rendering coat DP, based on EPD No. *EPD-VDL-20190056-IBG1-DE*

A dummy was created for the dowel EPD because the dataset was not modelled by Sphera.

- Dowels, based on EPD No. *EPD-EJO-20210060-IBD1-DE*

### 3.6 Data quality

Data quality can be regarded as good. The environmental results were largely calculated based on externally verified LCA data taken from IBU environmental product declarations. The data used in the component EPDs was last revised less than 8 years ago. However, the data for the individual components have different reference periods due to the use of EPDs as data base, which may result in some inconsistencies between the energy datasets used.

### 3.7 Period under consideration

Information on the mix of components, the quantities per m<sup>2</sup> employed and the underlying EPDs were laid down by the Verband für Dämmsysteme, Putz und Mörtel (VDPM) e.V. in the context of this study for 2022. It represents variants of WDVS superstructures currently in use.

### 3.8 Geographic representative status

Country or region in which the declared product system is manufactured and possibly used and subjected to end-of-life treatment: Germany

### 3.9 Allocation

The production of WDVS leaves no by-products. As for the individual components, it can be assumed that relevant allocations were accounted for in advance when the respective EPDs or background data were drawn up.

### 3.10 Comparability

On the whole, EPD data can only be compared or evaluated if all datasets to be compared were generated in accordance with EN 15804 and the building context and

product-specific performance characteristics are taken into consideration. The *Sphera LCA FE Sphera Managed LCA Content*, CUP version 2023.1 database was used for modelling.

## 4. LCA: scenarios and additional technical information

### Characteristic product properties biogenic carbon

Only the packaging contains biogenic carbon, not the declared product itself.

### Information describing the biogenic carbon content at the factory gate

Designation	Value	Unit
Biogenic carbon contained in product	-	kg C
Biogenic carbon contained in packaging	0.23	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg CO<sub>2</sub>.

The following technical information is used as basis for the declared modules or can be used to derive specific scenarios under a building assessment.

### Transport to construction site (A4)

Designation	Value	Unit
Litres of fuel	0.038	l/100km
Transport distance	100	km
Capacity utilisation (including empty runs)	61	%

### Installation in building (A5)

Installation into a building includes power consumption during installation and the thermal utilisation of the packaging materials.

Designation	Value	Unit
Power consumption	7.58	MJ
Packaging (wood pallet)	0.51	kg
Packaging (wood)	0.05	kg
Packaging PE	0.045	kg
Packaging PP	0.263	kg

### Usage (B1)

Also see chapter 2.12: Reference service life. In the use phase, the carbonation-related CO<sub>2</sub> integration is considered for mineral WDVS components. These are accounted for in accordance with the VDPM e.V.'s respective model EPDs Mortar.

### End of life (C1-C4)

Designation	Value	Unit
Waste type collected separately	13.9	kg
To waste processing (C3)	13.9	kg
To energy recovery (C3)	2.4	kg
To landfill C4	11.5	kg

### Reuse, recuperation and recycling potential (D)

Energetic credits based on thermal utilisation result from the electricity mix and thermal energy produced from natural gas (EU).

## 5. LCA: Results

The following tables show the life cycle assessment results in relation to the life cycle stages. See chapter 4 for the basic details of all declared modules.

**SPECIFICATION OF SYSTEM BOUNDARIES (X = INCLUDED IN LIFE CYCLE ASSESSMENT; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)**

Production stage			Building construction stage		Usage stage							Disposal stage			Credits and burdens outside the system boundaries	
Raw materials supply	Transport	Manufacture	Transport from manufacturer to site of use	Installation	Use / Application	Maintenance	Repair	Replacement	Renewal	Energy consumption for operation of	Water consumption for operation of	Deconstruction / Demolition	Transport	Waste treatment	Disposal	Reuse, recuperation or recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	MND	MND	MND	MND	MND	MND	X	X	X	X	X

**LIFE CYCLE ASSESSMENT RESULTS – ENVIRONMENTAL IMPACT acc. to EN 15804+A2: 1 m<sup>2</sup> WDVS, EPS glued, with 160 mm insulating material thickness; 13.9 kg/m<sup>2</sup>**

Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
GWP total	kg CO <sub>2</sub> -eq.	2.17E+01	1.14E-01	3.29E+00	0	3.72E-03	8.44E-02	1.07E+01	1.73E-01	-3.73E+00
GWP-fossil	kg CO <sub>2</sub> -eq.	2.24E+01	1.13E-01	2.41E+00	0	3.69E-03	8.36E-02	1.07E+01	1.72E-01	-3.71E+00
GWP-biogenic	kg CO <sub>2</sub> -eq.	-7.57E-01	4.11E-04	8.84E-01	0	1.64E-05	3.04E-04	1.08E-03	4.48E-06	-1.91E-02
GWP-luluc	kg CO <sub>2</sub> -eq.	1.38E-02	6.77E-04	2.42E-04	0	2.19E-05	5.01E-04	4.29E-04	5.35E-04	-2.23E-04
ODP	kg CFC11-eq.	1.36E-10	2.79E-14	3.26E-13	0	9.04E-16	2.06E-14	8.39E-13	4.43E-13	-2.49E-11
AP	mol H <sup>+</sup> -eq.	5.49E-02	1.51E-04	2.01E-03	0	5.01E-05	1.09E-04	4.41E-03	1.22E-03	-4.26E-03
EP-freshwater	kg P-eq.	5.79E-05	2.67E-07	2.15E-07	0	8.64E-09	1.97E-07	4.46E-07	3.48E-07	-5.16E-06
EP-marine	kg N-eq.	1.19E-02	5.63E-05	6.33E-04	0	2.28E-05	4.02E-05	1.3E-03	3.16E-04	-1.29E-03
EP-terrestrial	mol N-eq.	1.29E-01	6.66E-04	7.58E-03	0	2.51E-04	4.78E-04	1.71E-02	3.47E-03	-1.38E-02
POCP	kg NMVOC-eq.	1E-01	1.34E-04	1.74E-03	0	6.82E-05	9.65E-05	3.57E-03	9.52E-04	-3.61E-03
ADPE	kg Sb-eq.	3.72E-04	8.15E-09	8.05E-09	0	2.64E-10	6.03E-09	1.68E-08	7.96E-09	-2.33E-07
ADPF	MJ	5.01E+02	1.54E+00	2.14E+01	0	4.98E-02	1.14E+00	4.32E+01	2.29E+00	-6.67E+01
WDP	m <sup>3</sup> world-eq. deprived	1.53E+00	5.94E-04	1.96E-01	0	1.92E-05	4.39E-04	6.56E-01	1.89E-02	-3.02E-01

GWP = global warming potential; ODP = atmospheric ozone layer depletion potential; AP = soil and water acidification potential; EP = eutrophication potential; POCP = tropospheric ozone formation potential; ADPE = abiotic resource scarcity potential – non-fossil resources (ADP – substances); ADPF = abiotic resource scarcity potential – fossil fuels (ADP – fossil energy carriers); WDP = water deprivation potential (user)

**LIFE CYCLE ASSESSMENT RESULTS – RESOURCE UTILISATION INDICATORS acc. to EN 15804+A2: 1 m<sup>2</sup> WDVS, EPS glued, with 160 mm insulating material thickness; 13.9 kg/m<sup>2</sup>**

Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
PERE	MJ	7.26E+01	1.03E-01	8.65E+00	0	3.34E-03	7.63E-02	1.5E+00	3.75E-01	-1.7E+01
PERM	MJ	1.05E+01	0	-8.45E+00	0	0	0	-1.01E+00	0	0
PERT	MJ	8.31E+01	1.03E-01	2.03E-01	0	3.34E-03	7.63E-02	4.88E-01	3.75E-01	-1.7E+01
PENRE	MJ	3.6E+02	1.54E+00	3.55E+01	0	4.99E-02	1.14E+00	1.68E+02	2.29E+00	-6.67E+01
PENRM	MJ	1.42E+02	0	-1.41E+01	0	0	0	-1.25E+02	0	0
PENRT	MJ	5.02E+02	1.54E+00	2.14E+01	0	4.99E-02	1.14E+00	4.32E+01	2.29E+00	-6.67E+01
SM	kg	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0
FW	m <sup>3</sup>	1.25E-01	9.18E-05	7.57E-03	0	2.97E-06	6.79E-05	2.14E-02	5.78E-04	-1.38E-02

PERE = renewable primary energy as energy carrier; PERM = renewable energy for material utilisation; PERT = total renewable primary energy; PENRE = non-renewable primary energy as energy carrier; PENRM = non-renewable primary energy for material utilisation; PENRT = total non-renewable primary energy; SM = use of secondary materials; RSF = renewable secondary fuels; NRSF = non-renewable secondary fuels; FW = net utilisation of sweet water resources

**LIFE CYCLE ASSESSMENT RESULTS – WASTE CATEGORIES AND OUTPUT FLOWS acc. to EN 15804+A2: 1 m<sup>2</sup> WDVS, EPS glued, with 160 mm insulating material thickness; 13.9 kg/m<sup>2</sup>**

Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
HWD	kg	1.66E-05	2.6E-12	1.07E-09	0	8.42E-14	1.92E-12	2.15E-09	4.94E-11	-4.59E-09
NHWD	kg	2.24E+00	2.31E-04	2.36E-02	0	7.47E-06	1.71E-04	5.9E-02	1.15E+01	-3.11E-02
RWD	kg	1.05E-02	2.03E-06	1.83E-03	0	6.57E-08	1.5E-06	3.69E-03	2.58E-05	-4.51E-03
CRU	kg	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0

MER	kg	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	2.83E+00	0	0	0	1.22E+01	0	0
EET	MJ	0	0	6.53E+00	0	0	0	2.8E+01	0	0

HWD = hazardous waste sent to landfill; NHWD = disposed non-hazardous waste; RWD = disposed radioactive waste; CRU = components for reuse; MFR = materials for recycling; MER = materials for energy recovery; EEE = exported energy – electric; EET = exported energy – thermal

### LIFE CYCLE ASSESSMENT RESULTS – additional effect categories acc. to EN 15804+A2-optional: 1 m<sup>2</sup> WDVS, EPS glued, with 160 mm insulating material thickness; 13.9 kg/m<sup>2</sup>

Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
PM	Cases of illness	6.25E-07	1.23E-09	1.85E-08	0	2.68E-09	7.79E-10	3.92E-08	1.5E-08	-3.62E-08
IR	kBq U235-eq.	1.69E+00	2.17E-04	1.42E-01	0	7.04E-06	1.61E-04	2.87E-01	2.93E-03	-7.5E-01
ETP-fw	CTUe	2.55E+02	1.11E+00	4.87E+00	0	3.61E-02	8.22E-01	9.82E+00	1.25E+00	-1.29E+01
HTP-c	CTUh	9.97E-09	2.24E-11	1.07E-10	0	7.25E-13	1.66E-11	2.29E-10	1.93E-10	-7.1E-10
HTP-nc	CTUh	6.27E-07	1.14E-09	6.87E-09	0	5.57E-11	8.46E-10	1.38E-08	2.12E-08	-2.28E-08
SQP	SQP	1.78E+02	5.47E-01	3.49E-01	0	1.77E-02	4.05E-01	7.45E-01	5.78E-01	-1.12E+01

PM = potential occurrence of disease caused by particulate emissions; IR = potential effect through human exposition to U235; ETP-fw = potential toxicity reference unit for ecosystems; HTP-c = potential toxicity reference unit for humans (carcinogenic effect); HTP-nc = potential toxicity reference unit for humans (non-carcinogenic effect); SQP = potential soil quality index

Qualifier 1 – applies to the indicator potential effect through human exposition to U235: This effect category mainly covers the potential impact of low-dosage ionising radiation on human health in the nuclear fuel cycle. It does not account for effects caused by possible nuclear accidents and occupational exposition nor for the disposal of radioactive waste in subterranean installations. This indicator also does not cover the potential ionising radiation emitted by the ground, radon, and certain construction materials. Qualifier 2 – applies to the indicators: abiotic resource scarcity potential – non-fossil resources, abiotic resource scarcity potential – fossil fuels, water deprivation potential (user), potential toxicity reference unit for ecosystems, potential toxicity reference unit for humans – carcinogenic effect, potential toxicity reference unit for humans – non-carcinogenic effect, and potential soil quality index: Diligence must be applied when using the results of the environmental impact indicator because they are fraught with high uncertainties or experience with the indicator is limited.

The annex to this EPD contains the declaration for another WDVS with EPS insulating material. Differences are due to the differences in system layout.

## 6. LCA: Interpretation

### Life cycle:

The product system is dominated by the manufacturing phase across all effect categories.

Module A5 comprises both power consumption for installation and packaging disposal. Alongside the manufacturing phase, the end-of-life utilisation phase C3 is relevant.

Module C3 covers the necessary expenditures for processing (shredding, sorting) and thermal treatment of high-calorific insulating materials (EPS) in refuse incinerators (RI). The values for the disposal of all other materials except EPS in module C4 are negligibly small.

The negative values in module D reflect credits for the substitution of electric and thermal energy production from natural gas (EU mix) due to the utilisation of the packaging, plus additional credits from the utilisation of the insulating materials. The results for environmental effects are negligibly small in module A4 and modules C1 and C2.

### Modules A1-A3:

The principal life cycle phase of WDVS with EPS insulating material is the manufacturing phase.

In the manufacturing phase, the upstream processes of EPS and adhesive mortar production dominate the results for greenhouse potential (GWP), summer smog potential (POCP), fossil resource depletion (ADP F), and water consumption. Manufacture of the EPS insulating material has a significant impact because of the energy-intensive base material polystyrene and pentane as propellant especially in view of the summer smog potential (POCP).

On the other hand, the chains upstream of the manufacture of the reinforcement fabric dominate the resource consumption results (minerals and metals ADP E).

The other system components like finishing and rendering coat, too, have some influence while dowel manufacture has but a small influence. Transport of the components and the packaging is of marginal significance.

## 7. Verification

### 7.1 Radioactivity

Radioactivity was not measured because there are no statutory threshold values and the radioactivity of insulating materials is irrelevant to health and the environment according to the current state of knowledge.

### 7.2 Leaching

There are currently no harmonised European or national assessment criteria or emission scenarios which could be used to evaluate biocide bleeding from construction products exposed to rain.

## 8. List of references

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### CEN/TC 139/WG 10

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### EN 1991-1-4/NA

DIN EN 1991-1-4/NA:2010-12, National Annex – Nationally determined parameters - Eurocode 1: Actions on structures – Part 1-4: General actions – Wind actions.

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### EN 15804

DIN EN 15804:2022-03, Sustainability of construction works – Environmental product declarations – Fundamental rules for the product category construction products.

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DIN EN 15824:2017-09, Specifications for external renders and internal plasters based on organic binders.

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DIN EN 17237:2022-02 Draft: Thermal insulation products for buildings - External thermal insulation composite kits with a rendering system (ETICS kits) – Characteristics.

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#### **ISO 15686-8**

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#### **ISO/TS 15686-9**

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