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-20240370-IBP1-DE
Date of issue	09/01/2025
Valid until	08/01/2030

WDVS with mineral wool insulating board glued and dowelled

Verband für Dämmsysteme, Putz und Mörtel e.V.

Institut Bauen und Umwelt e.V.

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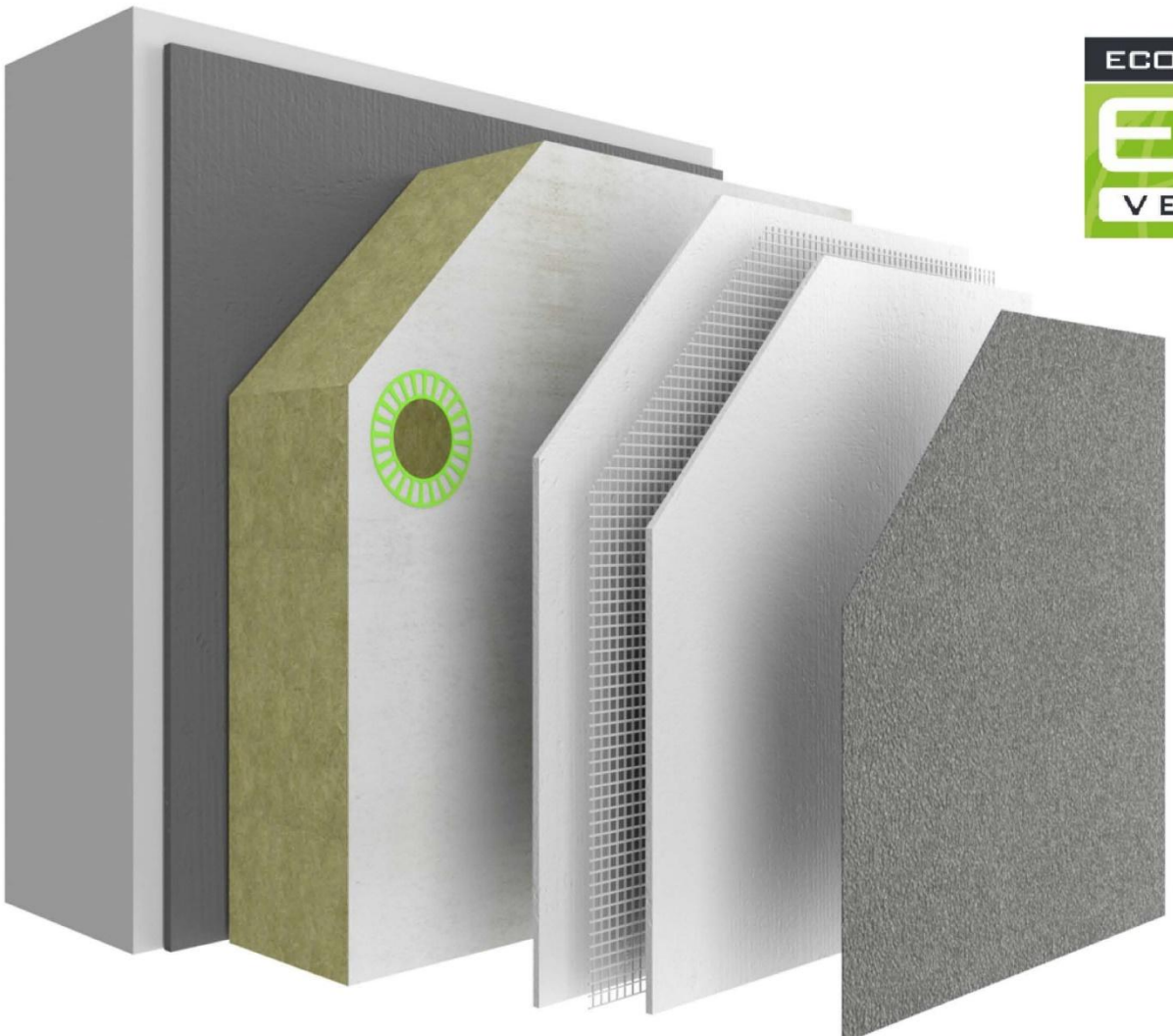


1. General information

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-20240370-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 mineral wool insulating board glued and dowelled

Owner of declaration

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

Declared product / Declared unit

1 m² thermal insulation composite system, 160 mm insulating material thickness with 0.035 to 0.048 W/(mK)

Scope:

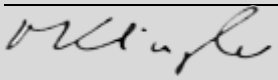
Thermal insulation composite systems (WDVS) consist of a number of different components/precursor products which in turn have a verified EPD. This document is a model EPD in which the life cycle assessment of the individual component EPDs with the highest environmental burdens (worst case) for adhesives, 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
☐ internal ☒ external



Matthias Klingler,
(Independent verifier)

2. Product

2.1 Product description/Product definition

Thermal insulation composite systems with glued-on and dowelled mineral wool insulating board consist of adhesive, mineral wool insulating board (MW), 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 this 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.

A thermal insulation composite system (WDVS in short) is a system consisting of matching construction materials for exterior installation on exterior walls of structures. They consist of an insulating material (glued and/or dowelled to the wall), a coat carrier layer (reinforced rendering coat), and a finishing layer with coating (finishing coat and paint). The insulating material as the main component determines the fundamental technical and energetic properties of the WDVS. The components of a WDVS are assembled at the construction site.

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/m²
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/m²	-
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) *	-	-
Thermal resistance acc. to EN 12667 / EN 12939 **	4.56	m²K/W

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

**) Value allows for WDVS (MW 035) without including the wall material

Classification acc. to *PCR Teil A*: 2c) 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-VDP-20230401-IBO1-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 mineral binding agent *EPD-VDP-20230401-IBO1-DE*

Coupling agent:
Dispersion coupling agent *EPD-VDL-20190052-IBG1-DE*

Finishing coat:
Normal plaster/finishing plaster *EPD-VDP-20230398-IBO1-DE*

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

Adhesive organic: 5.0 kg/m²
Insulating board MW: 20 kg/m² (160 mm)
Dowels: 0.285kg/m²

Reinforcement fabric: 0.176 kg/m²
mineral rendering coat: 5.6 kg/m²
coupling agent: 0.3 kg/m²
Mineral finishing coat: 3.0 kg/m²

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); (ethylenedioxy)dimethanol (EDDM); 3iodine2propinylbutylcarbamate (IPBC); methylisothiazolinone (MIT); sodium pyrithione; silver chloride; tetramethylolacetylendiurea (TMAD); zinc pyrithione. Film preservatives: diurone (DMCU), isoproturone, terbutryn, dichloroctylisothiazolinone (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/mm². 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/m² 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

Mineral finishing coats contain cement and limestone as binding agents. There is no known negative environmental impact during the use phase. 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 MW insulating boards and mineral system components are classified acc. to *DIN 4102-1* as flame-resistant and placed in construction material category A1.
This is equivalent to the category A1 or A2-s1, d0 acc. to *EN 13501-1.*
System-specific fire protection measures must be observed when installing thermal insulation composite systems.

Fire protection

Designation construction material category acc. to EN 13501-1: A1

Designation	Value
Construction material category acc. to EN 13501-1	A2
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 WDV 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 as complete systems or selectively deconstructed. MW insulating materials, together with any adhesions, are either sent to landfill or, if homogeneous, fed back into the manufacturing cycle for MW insulating material boards. Ground mineral fibres can also be utilised as an additive in brick production.

2.15 Disposal

The *EAK Waste Code* under the Waste Index Ordinance (*WIO*) for the insulating material is 170604 (waste identification: insulating material) and 170904 and 170903*, respectively, for the other components (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.

3. LCA: calculation rules

3.1 Declared unit

The declaration is based on the life cycle of 1 m² WDVS.

Declared unit

Designation	Value	Unit
Declared unit	1	m^2
Mass per unit area	34.4	kg/m^2
Layer thickness incl. adhesive and coating	0.17	m
Heat transfer coefficient (U value) of the thermal insulation composite system (MW 035) – without wall material	0.21	$W/(m^2K)$

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 (7.57 MJ/m²). 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 to C4, 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 (e.g., shredding) Module C4: disposal of overall system
Module D: credits for substitution of electric and thermal energy extracted from natural gas (EU mix) during packaging and insulating materials recycling

The mineral wool insulating material is not subjected to thermal utilisation because it is inflammable / has no high calorific value. All components are subjected to waste processing (C3) and sent to landfill (C4). Credits in D solely result from packaging utilisation.

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. Since the data is mainly EPD-based, the approach regarding the 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, data sets from the *Sphera Managed LCA Content* database were used for the following system components:

- Mineral wool MW (insulating material thickness 160 mm, bulk density 125 kg/m³)
- Wood fibre WF (insulating material thickness 160 mm, bulk density 180 kg/m³)
- EPS (insulating material thickness 160 mm, bulk density 15 kg/m³)

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

- Organic 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 mortal, 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.

However, the data for the individual components have different reference periods due to the use of EPDs as data base. Data for the component EPDs was collected between 2011 and 2015, 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 m² employed, and the underlying EPDs were laid down by the Verband für Dämmsysteme, Putz und Mörtel 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 acc. to *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	1.13	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg CO_2.

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	0.094	l/100km
Transport distance	100	km
Capacity utilisation (including empty runs)	61	%

Installation in building (A5)

Power consumption for installation and packaging treatment.

Designation	Value	Unit
Power consumption	7.57	MJ
Packaging (wood pallet)	2.74	kg
Packaging (wood)	0.09	kg
Packaging PE	0.129	kg
Packaging PP	0.01	kg

Usage (B1)

Also see chapter 2.12: Reference service life. In the use phase, the carbonation-related CO2 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 (C1C4)

All components are subjected to waste processing (C3) and sent to landfill (C4).
Credits in D solely result from packaging utilisation.

Designation	Value	Unit
Waste type collected separately	34.4	kg
To waste processing (C3)	34.4	kg
To energy recovery	-	kg
To landfill (C4)	34.4	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 building	Water consumption for operation of building	Dismantling / 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	MNR	MNR	MNR	MND	MND	X	X	X	X	X

LIFE CYCLE ASSESSMENT RESULTS – ENVIRONMENTAL IMPACT acc. to EN 15804+A2: 1 m² WDVS mineral wool, glued and dowelled, with 160 mm insulating material thickness; 34.4 kg/m²

Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
GWP total	kg CO_2-eq.	3.07E+01	2.82E-01	6.46E+00	-1.88E+00	9.23E-03	2.09E-01	7.08E+00	5.18E-01	-1.56E+00
GWP-fossil	kg CO_2-eq.	3.48E+01	2.8E-01	1.97E+00	-1.88E+00	9.14E-03	2.07E-01	7.08E+00	5.17E-01	-1.55E+00
GWP-biogenic	kg CO_2-eq.	-4.11E+00	1.02E-03	4.49E+00	0	4.06E-05	7.54E-04	1.54E-03	1.34E-05	-7.92E-03
GWP-luluc	kg CO_2-eq.	1.63E-02	1.68E-03	3.72E-04	0	5.44E-05	1.24E-03	1.03E-03	1.6E-03	-9.27E-05
ODP	kg CFC11-eq.	1.78E-10	6.92E-14	9.41E-13	0	2.24E-15	5.12E-14	4.17E-13	1.33E-12	-1.03E-11
AP	mol H+-eq.	1.98E-01	3.73E-04	2.7E-03	0	1.24E-04	2.7E-04	8.34E-03	3.66E-03	-1.77E-03
EP-freshwater	kg P-eq.	7.17E-05	6.61E-07	4.21E-07	0	2.14E-08	4.89E-07	7.05E-07	1.04E-06	-2.14E-06
EP-marine	kg N-eq.	2.39E-02	1.4E-04	8.19E-04	0	5.66E-05	9.96E-05	2.77E-03	9.46E-04	-5.36E-04
EP-terrestrial	mol N-eq.	6.16E-01	1.65E-03	1.05E-02	0	6.22E-04	1.18E-03	3.01E-02	1.04E-02	-5.76E-03
POCP	kg NMVOC-eq.	7.53E-02	3.31E-04	2.23E-03	0	1.69E-04	2.39E-04	7.66E-03	2.85E-03	-1.5E-03
ADPE	kg Sb-eq.	2.84E-04	2.02E-08	1.4E-08	0	6.55E-10	1.49E-08	2.93E-08	2.39E-08	-9.66E-08
ADPF	MJ	3.71E+02	3.81E+00	2.25E+01	0	1.24E-01	2.82E+00	1.04E+02	6.87E+00	-2.78E+01
WDP	m3 world-eq. deprived	1.51E+00	1.47E-03	5.5E-01	0	4.77E-05	1.09E-03	3.97E-02	5.65E-02	-1.25E-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 m² WDVS mineral wool, glued and dowelled, with 160 mm insulating material thickness; 34.4 kg/m²

Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
PERE	MJ	8.25E+01	2.56E-01	4.26E+01	0	8.28E-03	1.89E-01	3.97E-01	1.12E+00	-7.04E+00
PERM	MJ	4.41E+01	0	-4.21E+01	0	0	0	0	0	0
PERT	MJ	1.27E+02	2.56E-01	5.2E-01	0	8.28E-03	1.89E-01	3.97E-01	1.12E+00	-7.04E+00
PENRE	MJ	3.58E+02	3.82E+00	2.89E+01	0	1.24E-01	2.83E+00	1.04E+02	6.88E+00	-2.78E+01
PENRM	MJ	1.39E+01	0	-6.39E+00	0	0	0	0	0	0
PENRT	MJ	3.72E+02	3.82E+00	2.25E+01	0	1.24E-01	2.83E+00	1.04E+02	6.88E+00	-2.78E+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	m3	6.23E-02	2.27E-04	1.59E-02	0	7.37E-06	1.68E-04	1.57E-02	1.73E-03	-5.71E-03

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 m² WDVS mineral wool, glued and dowelled, with 160 mm insulating material thickness; 34.4 kg/m²

Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
HWD	kg	1.74E-06	6.44E-12	1.07E-09	0	2.09E-13	4.76E-12	5.3E-09	1.48E-10	-1.94E-09
NHWD	kg	7.11E+00	5.72E-04	7.56E-02	0	1.85E-05	4.23E-04	2.73E-02	3.44E+01	-1.29E-02
RWD	kg	7.82E-03	5.03E-06	1.86E-03	0	1.63E-07	3.72E-06	9.06E-03	7.73E-05	-1.87E-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	6.21E+00	0	0	0	0	0	0
EET	MJ	0	0	1.45E+01	0	0	0	0	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 m² WDVS mineral wool, glued and dowelled, with 160 mm insulating material thickness, 34.4 kg/m²

Indicator	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
PM	Cases of illness	1.99E-06	3.06E-09	2.31E-08	0	6.64E-09	1.93E-09	8.11E-08	4.5E-08	-1.5E-08
IR	kBq U235-eq.	8.04E-01	5.39E-04	1.45E-01	0	1.75E-05	3.98E-04	7.02E-01	8.79E-03	-3.1E-01
ETP-fw	CTUe	1.32E+02	2.76E+00	5.42E+00	0	8.94E-02	2.04E+00	2.33E+01	3.75E+00	-5.32E+00
HTP-c	CTUh	1.04E-07	5.55E-11	1.43E-10	0	1.8E-12	4.1E-11	4.55E-10	5.77E-10	-2.96E-10
HTP-nc	CTUh	8.54E-06	2.82E-09	8.96E-09	0	1.38E-10	2.1E-09	3.07E-08	6.35E-08	-9.52E-09
SQP	SQP	7.24E+02	1.36E+00	7.61E-01	0	4.4E-02	1E+00	9.8E-01	1.73E+00	-4.63E+00

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 mineral wool 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. Carbonation is reflected in module B1.
Alongside the manufacturing phase, the end-of-life utilisation phase C3 is relevant. The insulating material will not be subjected to thermal utilisation. Module C3 reflects the necessary processing expenditures (shredding, sorting).
Disposal of the WDVS at the construction rubble dump is of minor importance as regards the assessed environmental effects.
The negative values in module D reflect credits resulting from the substitution of electric and thermal energy produced from natural gas (EU mix) due to the utilisation of the packaging 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 mineral wool insulating material is the manufacturing phase.
In the manufacturing phase, the processes upstream of mineral fibre prodution dominate the results across all indicators, except resource consumption (ADP E minerals and metals). This indicator is dominated by the chains upstream of the production of the reinforcement fabric.
The remaining system components like adhesive mortar (mineral), rendering coat and finishing coat (mineral), and packaging have a minor impact on the results.
Transport of the components 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

PCR Teil A
Produktkategorie-Regeln für gebäudebezogene Produkte und Dienstleistungen, Teil A: Rechenregeln für die Ökobilanz und Anforderungen an den Projektbericht nach EN 15804+A2:2019. Institut Bauen und Umwelt e.V., version 1.3, 2022-08.

PCR Teil B: Wärmedämm-Verbundsysteme
Produktkategorie-Regeln für gebäudebezogene Produkte und Dienstleistungen, Teil B: Anforderungen an die EPD für Wärmedämmverbundsysteme, Institut Bauen und Umwelt e. V., version 8, 2023-10.

Allgemeine Anleitung zum IBU-EPD-Programm
Die Erstellung von Umwelt-Produktdeklarationen. Version 2.1, 2022-10. Institut Bauen und Umwelt e.V. (ed.). Online at https://ibu-epd.com/ (March 2024).

Sphera LCA FE (previously GaBi)
Sphera LCA For Experts (previously GaBi Software System) with associated databases Managed LCA Content MLC (previously GaBi databases), Sphera Solutions GmbH. CUP version: 2022.2. University of Stuttgart, Leinfelden-Echterdingen, MLC Data Documentation at https://sphera.com/product-sustainability-gabi-data-search/ (March 2024).

Standards

CEN/TC 351/WG 1
CEN/TC 351 Construction products – Assessment of release of dangerous substances. Workgroup 1: Release of hazardous substances from construction products into soil, ground water and surface water.

CEN/TC 139/WG 10
CEN/TC 139 Paints and varnishes. Workgroup 10: Laboratory methods for testing the efficacy of film preservatives according to the requirements of the biocide product directive (BPD)

DIN 4102-1
DIN 4102-1:1998-05, Fire behaviour of building materials and building components – Part 1: Building materials; concepts, requirements and tests.

DIN 55699
DIN 55699:2017-08, Application and processing of external thermal insulation composite systems (ETICS) with insulation of expanded polystyrene (EPS) or mineral wool (MW).

EN 1062-3
DIN EN 1062-3:2008-04, Paints and varnishes – Coating materials and coating systems for exterior masonry and concrete – Part 3: Determination of liquid water permeability.

EN 1991-1-4
DIN EN 1991-1-4:2010-12, Eurocode 1: Actions on structures – Part 1-4: General actions – Wind actions.

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.

EN 12667
DIN EN 12667: 2001-05, Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Products of high and medium thermal resistance.

EN 12939
DIN EN 12939:2001-02, Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Thick products of high and medium thermal resistance.

EN 13163
DIN EN 13162:2015-04, Thermal insulation products for buildings – Factory made mineral wool (MW) products – Specification.

EN 13501-1
DIN EN 13501-1:2019-05, Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests.

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

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

EN 15942
DIN EN 15942:2022-04, Sustainability of construction works – Environmental product declarations – Communication format business-to-business.

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

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

ISO 14040
DIN EN ISO 14040:2021-02, Environmental management – Life cycle assessment – Principles and framework.

ISO 14044
DIN EN ISO 14044:2021-02, Environmental management – Life cycle assessment – Requirements and guidelines.

ISO 15686-1
DIN EN ISO 15686-1:2011-05, Buildings and constructed assets – Service life planning – Part 1: General principles and framework.

ISO 15686-2
DIN EN ISO 15686-2:2012-05, Buildings and constructed assets – Service life planning – Part 2: Service life prediction procedures.

ISO 15686-3
DIN EN ISO 15686-3:2002-08, Buildings and constructed assets – Service life planning – Part 3: Performance audits and reviews.

ISO 15686-4
DIN EN ISO 15686-4:2014-01, Building Construction – Service Life Planning – Part 4: Service Life Planning using Building Information Modelling.

ISO 15686-5
DIN EN ISO 15686-5:2017-07, Buildings and constructed assets – Service life planning – Part 5: Life-cycle costing.

ISO 15686-7
DIN EN ISO 15686-7:2017-04, Buildings and constructed assets – Service life planning – Part 7: Performance evaluation for feedback of service life data from practice.

ISO 15686-8
DIN EN ISO 15686-8:2008-06, Buildings and constructed assets – Service-life planning – Part 8: Reference service life and service-life estimation.

ISO/TS 15686-9
DIN EN ISO/TS 15686-9:2008-12, Buildings and constructed assets – Service-life planning – Part 9: Guidance on assessment of service life data.

ISO 15686-10
DIN EN ISO 15686-10:2010-06, Buildings and constructed assets – Service-life planning – Part 10: When to assess functional performance.

ISO/TR 15686-11
DIN EN ISO/TR 15686-11:2014-08, Buildings and constructed assets – Service life planning – Part 11: Terminology.

Environmental product declarations

EPD-EJO-20210060-IBD1-DE
Befestigungssysteme für Wärmedämm-Verbundsysteme. EJOT SE & Co. KG, Market Unit Construction. Bad Laasphe 2021.

EPD-VDL-20190052-IBG1-DE
Haftvermittler auf Dispersionsbasis. Verband der deutschen Lack- und Druckfarbenindustrie (VdL) e.V., Frankfurt am Main 2019.

EPD-VDL-20190056-IBG1-DE
Dispersionsputz. Verband der deutschen Lack- und Druckfarbenindustrie (VdL) e.V., Frankfurt am Main 2019.

EPD-VDL-20190057-IBG1-DE
Kleber und Unterputz mit organischem Bindemittel. Verband der deutschen Lack- und Druckfarbenindustrie (VdL) e.V., Frankfurt am Main 2019.

EPD-VDP-20230398-IBO1-DE
Mineralische Werkmörtel: Putzmörtel-Normalputz/Edelputz. Verband für Dämmsysteme, Putz und Mörtel (VDPM) e.V., Berlin 2024.

EPD-VDP-20230401-IBO1-DE
Mineralische Werkmörtel: Putzmörtel-Armierungsputz. Verband für Dämmsysteme, Putz und Mörtel (VDPM) e.V., Berlin 2024.

EPD-VIT-20220104-IAC1-DE
Glasarmierungsgitter. Vitrulan Technical Textiles GmbH, Sonneberg 2022.

Further reading

AVV
Landfill Ordinance of 10 December 2001 (Federal Gazette of Laws and Ordinances I p. 3379) last amended by article 1 of the Ordinance of 30 June 2020 (Federal Gazette of Laws and Ordinances I p. 1533).

BBS
Bundesverband Baustoffe – Steine und Erden (bbs) e.V. and others (ed.): Mineralische Bauabfälle – Monitoring 2018. Bericht zum Aufkommen und zum Verbleib mineralischer Bauabfälle im Jahr 2018. Berlin, 2021.

BBSR
BBSR – Bundesinstitut für Bau-, Stadt- und Raumforschung: Nutzungsdauern von Bauteilen für Lebenszyklusanalysen nach Bewertungssystem Nachhaltiges Bauen (BNB), as at 24/02/2017. Online at https://www.nachhaltigesbauen.de/austausch/nutzungsdauern-von-bauteilen/ (March 2024)

BFS Merkblatt Nr. 21
BFS – Bundesausschuss für Farbe und Sachwertschutz: Merkblatt Nr. 21 "Technische Richtlinien für die Planung und Verarbeitung von Wärmedämm-Verbundsystemen, Frankfurt am Main, date: May 2012.

CE label
Information at www.ce-zeichen.de (Dipl.-Ing. Jo Horstkotte, Bismarckstr.18, D-76530 Baden-Baden) acc. to 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 (2011R030 - DE - 16.06.2014 - 001.003).

CreaSolv
CreaCycle GmbH, Grevenbroich (ed.): position paper "CreaSolv® Prozess - Lösemittelbasiertes Werkstoff-Recycling: Technologien des werkstofflichen Recyclings in der Kreislaufwirtschaft für Kunststoffe – eine kritische Bestandsaufnahme". Online at https://www.creasolv.de/images/2021.04.15_CreaSolv_Positionspapier

Cziesielski/Vogdt
Cziesielski E., Vogdt F. U.: Schäden an Wärmedämm-Verbundsystemen; Schadensfreies Bauen (ed. G. Zimmermann), Vol. 20; Fraunhofer IRB-Verlag. 2nd, revised and expanded edition, Stuttgart 2007.

DepV
Landfill Ordinance of 27 April 2009 (Federal Gazette of Laws and Ordinances I p. 900) last amended by article 3 of the Ordinance of 9 July 2021 (Federal Gazette of Laws and Ordinances I p. 2598).

EAK Waste Code
Ordinance Implementing the European Waste Catalogue (EAK Ordinance – EAKV) of 13 September 1996 (Federal Gazette of Laws and Ordinances I p. 1428) Federal Gazette of Laws and Ordinances III/FNA 2129–27–2–6, amended by art. 8 of the Ordinance Implementing the European Waste Catalogue of 10 December 2001 (Federal Gazette of Laws and Ordinances I p. 3379).

ECHA List
European Chemicals Agency (ECHA): Candidate List of substances of very high concern (SVHC) for Authorisation, published according to article 59 para. 10 of the REACH Regulation (22/04/2024). Online at https://echa.europa.eu/de/information-on-chemicals/active-substance-suppliers (April 2024).

EC Safety Data Sheet
Available on the website of the relevant VDPM e.V. affiliate company.

EOTA EAD
European Organisation for Technical Assessment (EOTA): European Assessment Document EAD 040083-00-0404 for thermal insulation composite kits with rendering system. Online at https://www.eota.eu/download?file=/2014/14-04-0083/for%20ojeu/ead%20040083-00-0404_ojeu2020.pdf (March 2024)

ETA nn/nnnn
European Technical Assessment / Europäische technische Bewertung No. nn/nnnn. Online at https://www.eota.eu/etassessments und https://www.dibt.de/de/service/zulassungsdownload/eta-verzeichnisse (March 2024).

GISBAU
Gefahrstoff-Informationssystem der Berufsgenossenschaft der Bauwirtschaft (BG BAU). Online at https://www.bgbau.de/themen/sicherheit-und-gesundheit/gefahrstoffe/gisbau (March 2024).

IBP-Bericht HTB 005/2023
IBP-Bericht HTB 005/2023: Lengfeld K., Krus M., Künzel H.: Beurteilung des Langzeitverhaltens ausgeführter Wärmedämmverbundsysteme. Fraunhofer-Institut für Bauphysik IBP, Stuttgart 2024. Online at https://www.vdpm.info/wp-content/uploads/2023/08/forschungsberichte-Beurteilung-der-Langszeitbewaehrung_2023.pdf (March 2024)

IBP-Bericht UHS-041/2023
IBP-Bericht UHS-041/2023: Scherer Chr., Schwitalla Chr. u.a.: Ressourcen der Zukunft für Dämmsysteme, Putze und Mörtel, Fraunhofer-Institut für Bauphysik IBP, Stuttgart 2023. Online at https://www.vdpm.info/wp-content/uploads/2023/10/gutachten-VDPM_Ressourcen-der-Zukunft_20230915_041.pdf (March 2024)

MVV TB
MVV TB - Muster-Verwaltungsvorschrift Technische Baubestimmungen. Ed.: Deutsches Institut für Bautechnik (DIBt), Berlin. Edition 2023/1.

PS-Loop
Industrieverband Hartschaum (IVH) e.V., Berlin (ed.): EPS-Leitfaden für Weiterverwertung & Recycling - PolyStyreneLoop (PS-Loop). Online at https://www.ivh.de/wp-content/uploads/EPS-Leitfaden-Weiterverwertung-Recycling-12-2021_IVH_VDPM.pdf

Rosemeier
Rosemeier G.-E.: Windbelastung von Bauwerken: Hoch- und Brückenbauten, Schalen, Leichte Flächentragwerke. Neue Windlastnorm DIN 1055-4. Grundlagen: Baudynamik, Aerodynamik, Luftturbulenzen. 2nd updated edition 2009.

VDPM Qualitätsrichtlinien MW
Verband für Dämmsysteme, Putz und Mörtel (VDPM) e.V. (ed.): Qualitätsrichtlinien für Dämmstoffe zur Verwendung in Wärmedämm-Verbundsystemen (WDVS) aus Mineralwolle (MW), Berlin, edition Juni 2024.

VDPM Steinwolle
Verband für Dämmsysteme, Putz und Mörtel (VDPM) e.V. (ed.): Der Weg zum schnellen und einfachen Recycling von Baustellen-Verschnitt aus Steinwolle, Berlin, edition Juni 2022. Online at https://www.vdpm.info/wp-content/uploads/2022/07/merkblatt-Recycling-Mineralwolle_07-2022.pdf (March 2024).

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

Regulation (EU) No. 528/2012
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

WTA-MB 2-13
WTA – Wissenschaftlich-Technische Arbeitsgemeinschaft für Bauwerkserhaltung und Denkmalpflege e.V. (ed.): WTA-Merkblatt 2-13 'Wärmedämm-Verbundsysteme: Wartung, Instandsetzung, Verbesserung', edition 2015.

Z-33.YY-XXXX
Allgemeine bauaufsichtliche Zulassung/Allgemeine Bauartgenehmigung des Deutschen Instituts für Bautechnik (DIBt), Berlin für Wärmedämm-Verbundsysteme in Abhängigkeit des verwendeten Dämmstoffes und der Befestigungsmethode. Online at https://www.dibt.de/de/bauprodukte/informationsportal-bauprodukte-und-bauarten/produktgruppen/bauproduktkategorie/waerme-und-schallschutz (March 2024).

Publisher

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Programme holder

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Life cycle assessment performed by

Sphera Solutions GmbH
Hauptstrasse 111
70771 Echterdingen-Leinfelden
Germany

+49711341817-0
info@sphera.com
www.sphera.com

Owner of declaration

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

+49 (0)30 403670750
info@vdpm.info
www.vdpm.info