Environmental Product Declaration

In accordance with IS0 14025 and EN 15804

Product name	GRF WDF-05 BO 1L*8 L001
EPD number	EPD-FEI-20250069-IBP1-EN
Product type / EPD model	Products based on vinyl chloride polymers

Declaration that the above mentioned product complies with the above mentioned European Model Environmental Product Declaration.

Bolton Adhesives, which carries the brand Griffon, is a member of FEICA (the Association of the European Adhesive & Sealant Industry) which has developed European Model EPDs. These Model EPDs were verified by the independent institute IBU (Institut Bauen und Umwelt); Germany's EPD programme holder organisation.

The European Model EPDs have been published on the FEICA website, and also on the websites of the IBU [1] and in future on ECO (Platform of the European EPD Programme Operators) and can be downloaded there.

As a member of FEICA, and with the help of an internal FEICA members' guidance paper, we are entitled to determine the compatibility of our product with the European Model EPD.

By means of this declaration, we confirm that this product is covered by the mentioned European Model EPD according to the guidance developed for this purpose. This means that the LCA data and the other content of the attached Model EPD apply to the above mentioned product and can be used for the assessment of buildings.

This declaration is valid only for this product as specifically covered by the European Model EPD and according to the guidance specifically developed for this purpose. We cannot and will not be held liable for any potential misuse/change of the EPD.

5 March 2026

Signed by:

Hans Klerks
Manager R&D

Signed by:

Remko Tetenburg
Chief Executive Officer

This document is valid without signature.

[1] https://ibu-epd.com/en/published-epds/

ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	FEICA, IVK, DBC
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-FEI-20250069-IBP1-EN
Issue date	04.06.2025
Valid to	03.06.2030

Products based on vinyl chloride polymers

DBC - Deutsche Bauchemie e.V.

FEICA - Association of the European Adhesive and Sealant Industry

IVK - Industrieverband Klebstoffe e.V.

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1. General Information

DBC - Deutsche Bauchemie e.V.
FEICA - Association of the European Adhesive and Sealant Industry
IVK - Industrieverband Klebstoffe e.V.

Products based on vinyl chloride polymers

Programme holder

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

Owner of the declaration

DBC, Mainzer Landstr. 55, D-60329 Frankfurt a.M.
FEICA, Rue Belliard 40, B-1040 Brussels
IVK, Völklingerstr. 4, D-40219 Düsseldorf

Declaration number

EPD-FEI-20250069-IBP1-EN

Declared product / declared unit

1 kg product based on vinyl chloride polymers; density 0.8 -1.1 g/cm³

This declaration is based on the product category rules:

Coatings with organic binders, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

04.06.2025

Valid to

03.06.2030

Scope:

This verified EPD entitles the holder to bear the symbol of the Institut Bauen und Umwelt e.V. It exclusively applies for products produced in Europe and for a period of five years from the date of issue.
This EPD is a Model EPD where the product displaying the highest environmental impact in a group was selected for calculating the EPD results.
This EPD may be used by members of DBC, FEICA and IVK and their members provided it has been proven that the respective product can be represented by this EPD. For this purpose a guideline is available at the secretariats of the three associations. The members of the associations are listed on the respective websites.
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 EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

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

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Matthias Schulz,
(Independent verifier)

2. Product

2.1 Product description/Product definition

This EPD comprises physical drying products based on vinyl chloride polymers with a volatile organic compound (VOC) content ≤90 % (VOC definition according to *Decopaint Directive*). The one-component products are manufactured using vinyl chloride polymers, solvents and optionally other polymers and additives. The products fulfil specific functions in the construction and repair of pipes. The product displaying the highest environmental impacts was used as a representative product for calculating the Life Cycle Assessment results (worst-case approach).
For the placing on the market in the European Union/European Free Trade Association (EU/EFTA) with the exception of Switzerland, products falling under *Regulation (EU) No 305/2011 (CPR)* need a Declaration of Performance taking into consideration either the relevant harmonised European standard or the European Technical Assessment and the CE marking. For the application and use of the products the respective national provisions apply.

2.2 Application

Products based on vinyl chloride polymers are used for adhesives for joining pipes, fittings and components of unplasticised poly (vinyl chloride) (PVC-U), chlorinated poly(vinyl chloride) (PVC-C), acrylonitrile-butadiene-styrene (ABS) and styrene copolymer blends (PVC+SAN) in thermoplastic piping systems for non-pressure applications and fluids under pressure.

Applications for these pipe systems can be the transport of wastewater, (drinking) water and liquids in and outside of residential and commercial buildings and industrial installations.

2.3 Technical Data

The density of the products is between 0.8 and 1.1 g/cm³; other relevant technical data can be found in the manufacturer's technical documentation.

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to
EN 14680:2015/EN 14680:2006: This European Standard specifies the requirements and test methods for adhesives used for joining the components of unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly(vinyl chloride)(PVC-C), acrylonitrile -butadiene-styrene (ABS) and styrene copolymer blends (PVC+SAN) in thermoplastic piping systems for non-pressure applications (e.g. soil and waste discharge), independent of the application area.

EN 14814:2016/EN 14814:2007: This European Standard specifies the requirements and test methods for adhesives used for joining the components of unplasticised poly(vinyl chloride) (PVC-U), chlorinated poly(vinyl chloride) (PVC-C), acrylonitrile-butadiene-styrene (ABS) and styrene copolymer blends (PVC+SAN) in thermoplastic piping systems for fluids under pressure, independent of the application area.

Typical data

Due to the variety of formulations and formulation types, it is not possible to give generally valid exact figures for specific technical properties, the following information can only be given as typical values.

Name	Value	Unit
Density acc. to EN ISO 2811-1	800 - 1100	kg/m³
Shear strength PVC-C/PVC-U /24h acc. to EN 14814 and EN 14680	>1.5	MPa
Shear strength PVC-C / 480h+96h acc. to EN 14814 and EN 14680	>10.0	MPa
Shear strength PVC-U / 480h+96h acc. to EN 14814 and EN 14680	>7.0	MPa
Pressure resistance / 480h+96h acc. to EN 14814 and EN 14680	>1000h no leakage	

2.4 Delivery status

Liquid to jelly (or pasty) in containers (tube, tin, bottle or bucket) made of aluminium, tinplate or plastic. Small packages contain 0.1 to 1 kg in cans, bigger ones up to 5 kg. Typical container sizes contain 0.5 – 5 kg (up to 25 kg) of product. The LCA is based on tinplate, carton boxes, plastic and wood packaging (for the pallet). Products packed in small packages for the DIY market are not considered.

2.5 Base materials/Ancillary materials

Products based on vinyl chloride polymers with a VOC content ≤90 % usually comprise vinyl chloride polymers and optionally another polymer ([co]polymer of vinyl chloride, chlorinated polyvinyl chloride, acrylonitrile-butadiene-styrene-copolymer), additives and a solvent blend.
After the installation on site, the physical drying of the adhesive layer takes place and a solid polymer layer is formed which bonds to the two substrates (cold welding of the surfaces).
The formulations can contain additives such as viscosity regulators for fine-tuning the product features. Typically, the products covered by this EPD contain the following ranges of base materials and auxiliaries (% by mass):
solid polymer: 10-30
solvent blend: 70-90
additives/pigments: ~ 0-10
VOC: ≤90 % according to the definition of *Decopaint Directive* **(mandatory)**

These ranges are average values and the composition of products complying with the EPD can deviate from these concentration levels in individual cases. More detailed information is available in the respective manufacturers' documentation (e.g. product data sheets).
Note: For companies to declare their products within the scope of this EPD it is not sufficient to simply comply with the product composition shown above. The application of this EPD is possible only for member companies of DBC, FEICA, and IVK member associations and only for specific formulations with a total score below the declared maximum score for a product group according to the associated guidance document.

1. substances from the 'Candidate List of Substances of Very High Concern for Authorisation' (SVHC)

If the product based on vinyl chloride polymers contains SVHC exceeding 0.1 percentage by mass, the respective SVHC, its CAS number, information on the concentration and/or concentration range together with information on their hazardous properties are listed in the safety data sheet of the respective product.

2. CMR substances in categories 1A and 1B

If the product based on vinyl chloride polymers contains carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B exceeding 0.1 percentage by mass, the respective CMR substances, information on the concentration and/or concentration range together with information on their hazardous properties are listed in the safety data sheet of the respective product.

3. Biocide products added to the construction product If the product based on vinyl chloride polymers contains biocide products, the active substances, information on the concentration and/or concentration range, the product type together with information on their hazardous properties are listed in the safety data sheet of the respective product.
Note: The products do not contain biocides.

2.6 Manufacture

The components of the formulation are usually mixed batch-wise and packaged for delivery.

2.7 Environment and health during manufacturing

As a general rule, no other environmental protection measures other than those specified by law are necessary.

2.8 Product processing/Installation

Products based on vinyl chloride polymers are processed by brush.
Precautions for safe handling and storage (e.g. air exchange, exhaust ventilation, personal protective measures, conditions for safe storage) must be observed in accordance with the information on the safety data sheet.

2.9 Packaging

A detailed description of packaging is provided in section 2.4. Completely empty containers and clean foils can be recycled.

2.10 Condition of use

During the use phase, products based on vinyl chloride polymers are essentially inert. They are long-lasting adhesives enabling piping systems in and outside of buildings and also make an essential contribution in retaining their function and long-term value.

2.11 Environment and health during use

Option 1- Products for applications outside indoor areas where people stay permanently
During use, after fully drying the adhesives based on vinyl chloride polymers are inert. Chemically they are very similar to the PVC pipes that they bond. No risks are known for water, air and soil if the products are used as designated.

Option 2- Products for applications inside indoor areas with permanent stays by people
When used in indoor areas with permanent stays by people, evidence of the emission performance of construction products in contact with indoor air must be submitted according to national requirements. No further influences on the environment and health by emanating substances are known.

2.12 Reference service life

Adhesives based on vinyl chloride polymers fulfil specific functions in the construction buildings, particular in the piping system. The anticipated reference lifetime depends on the specific installation situation and the exposure associated with the product. The lifetime can be influenced by weathering as well as mechanical or chemical loads. The expected service life for pipe systems is between 50 and 100 years.
More information regarding the sustainability of piping systems, where adhesive bonding is an integral part, can be found at Plastic Pipes and the United Nations Sustainable Development Goals (teppfa.eu)

2.13 Extraordinary effects

Fire
The adhesives based on vinyl chloride polymers are highly flammable liquids. After drying they are inert. Chemically they are very similar to the PVC pipes that they bond. Therefore, bonding components are an integral part of the piping system. Only the reaction to fire/fire classes of the piping is therefore relevant.

Water
Dry adhesives based on vinyl chloride polymers are chemically inert and insoluble in water. They are often used to join water pipes in buildings.
When used in pipe systems which will be in contact with drinking water, local regulations must be maintained.

Mechanical destruction
Mechanical destruction of solid dried adhesives based on vinyl chloride polymers does not lead to any decomposition products which are harmful to the environment or health according to present knowledge.

2.14 Re-use phase

Products based on vinyl chloride polymers cannot be recycled. After fully drying the adhesives based on vinyl chloride polymers are inert. Chemically they are very similar to the PVC pipes that they bond. According to present knowledge, no environmentally harmful effects are generally anticipated in landfilling, for example, as a result of de-construction and recycling of building materials with adherent dry products. Remains of adhesives are not taken into consideration during disposal. They do not interfere with the disposal/recycling of the remaining components of the piping system.

2.15 Disposal

Residual material which cannot be used or recycled must be dried. The residual solid product residue is not special waste. Non-dried product residue is hazardous waste. Empty, dried containers (free of drops and scraped clean) are directed to the recycling process. Residue must be directed to proper waste disposal taking into consideration the local guidelines. The following waste codes according to the European List of Waste (*2000/532/EC*) can apply:
Hardened product residue:
European Waste Catalogue (EWC) code 080112 (waste paint and varnish with the exception of that mentioned in 08 01 11)
Non-hardened product residue:
European Waste Catalogue (EWC) code 080409 (adhesives and sealants containing organic solvents or other hazardous substances)

2.16 Further information

More information is available on the manufacturer's product or safety data sheets and on the manufacturer's websites or on request. Valuable technical information is also available on the associations' websites.

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to the declared unit of 1 kg of product based on vinyl chloride polymers applied into the building with a density of 0.8 - 1.1 g/cm³ in accordance with the *IBU PCR part B* for coatings with organic binders.

The results of the Life Cycle Assessment provided in this declaration have been selected from the product with the highest environmental impact (worst-case scenario).

Depending on the application, a corresponding conversion factor such as the density to convert volumetric use to mass must be taken into consideration.

The Declaration type is according to *EN 15804*: Cradle to gate with options, modules C1–C4, and module D (A1–A3, C, D) and additional modules (A4-A5).

Declared unit

Name	Value	Unit
Declared unit	1	kg
Gross density	0.8 - 1.1	g/cm³

3.2 System boundary

Modules A1, A2 and A3 are taken into consideration in the LCA:

- A1 Production of preliminary products
- A2 Transport to the plant
- A3 Production incl. provision of energy, production of packaging as well as auxiliaries, waste treatment and emissions to air
- A4 Transport to site
- A5 Installation, product applied into the building during A5 phase operations and packaging disposal. The emissions of VOC (Volatile Organic Compounds) and electricity consumption are also considered in this module. The end of life for the packaging material considered is described below:
  - incineration, for materials like plastic, cardboard and wood.
  - landfill, for inert materials like metals
  In this module is also considered the incineration of product residue (1%) and the extra production of this amount.
- C1-C2-C3-C4-D: the building deconstruction (demolition process) takes place in the C1 module which considers energy production and consumption in terms of diesel and all the emissions connected with the fuel-burning process to run the machines. After the demolition, the product is transported to the end-of-life processing (C2 module) where all the impacts related to the transport processes are considered. For the precautionary principle and as a worst-case scenario, thermal treatment is the only end-of-life scenario considered. This is modelled by the incineration process (module C3) where the product ends its life cycle. Module C4 is not relevant for the EoL of this product.
  Module D accounts for potential benefits that are beyond the defined system boundaries. Credits are generated during the incineration of wastes and related energy produced that are occurring in the A5 and C3 modules.

3.3 Estimates and assumptions

For this EPD formulation and production data defined and collected by the associations were considered. Production waste was assumed to be disposed of by incineration as a worst-case.

An average of steel, plastic containers, wooden pallets and cardboard was considered in the LCA.

3.4 Cut-off criteria

All raw materials submitted for the formulations and production data were taken into consideration.

The manufacture of machinery, plant and other infrastructure required for the production of the products under review was not taken into consideration in the LCA.

Transport of packaging materials is excluded.

3.5 Background data

Data from the *Managed LCA Content database SP40* (2020) was used as background data.

3.6 Data quality

Representative products were evaluated for this EPD and the product displaying the highest environmental impact was selected for calculating the LCA results. The background data sets used are less than 8 years old.

Production data and packaging are based on details provided by the manufacturer. The formulation used for evaluation refers to a specific product.

The data quality of the background data is considered to be good.

3.7 Period under review

Representative formulations are valid for 2024.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Europe

3.9 Allocation

Mass allocation has been applied when primary data have been used and implemented into the LCA model.

3.10 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. *Sphera's Managed LCA Content SP 40* (2020) serves as background database for the calculation.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The packaging material contains biogenic carbon content which is presented below.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.0665	kg C

For the preparation of building life cycle assessments, it must be taken into account that in module A5 (installation in the building) the biogenic amount of CO_2 (0.0665 kg C * 3.67 = 0.244 kg CO_2-eq.) of the packaging bound in module A1-A3 is mathematically booked out.

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

The emission factor associated with the electricity considered for the production phase is: 0.466 kg CO_2-eq. / kWh

Transport to the building site (A4)

Name	Value	Unit
Transport distance	2000	km
Gross weight	34 - 40	t
Payload capacity	27	t

Assembly (A5)

Name	Value	Unit
Material loss	0.01	kg
Electricity consumption	0.1	kWh

Material loss regards the amount of product not used during the application phase into the building. This amount is 1 % of the product, impacts related to the production of this part are charged to the A5 module.
This percentage is considered as waste to incineration and impacts of its end of life have been considered in the LCA model and declared in A5.

End of life (C1-C3)

Name	Value	Unit
Collected as mixed construction waste	0.15	kg
Incineration	0.15	kg

The amount of product considered in the end-of-life does not correspond to 1 kg because an amount of VOC corresponding to 0.85 kg is emitted during the installation phase.

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = 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	X	X	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg 1 kg of product based on vinyl chloride polymers

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	7.37E+00	1.42E-01	7.73E-01	4.22E-05	7.48E-04	1.9E-01	0	-3.68E-01
GWP-fossil	kg CO_2 eq	7.53E+00	1.42E-01	5.74E-01	4.21E-05	7.47E-04	1.9E-01	0	-3.67E-01
GWP-biogenic	kg CO_2 eq	-1.63E-01	2.08E-04	1.99E-01	6.25E-08	1.09E-06	2.94E-05	0	-8.62E-04
GWP-luluc	kg CO_2 eq	3.66E-03	8.14E-06	1.06E-04	2.45E-09	4.28E-08	6.32E-06	0	-2.57E-04
ODP	kg CFC11 eq	7.78E-11	2.27E-17	7.79E-13	6.84E-21	1.2E-19	5.05E-17	0	-3.84E-15
AP	mol H^+ eq	1.62E-02	4.04E-04	3.74E-04	5.45E-07	2.13E-06	9.97E-05	0	-5.14E-04
EP-freshwater	kg P eq	7.27E-06	3.15E-08	1.97E-07	9.48E-12	1.66E-10	1.81E-08	0	-4.74E-07
EP-marine	kg N eq	3.61E-03	1.83E-04	9.05E-05	2.47E-07	9.63E-07	3.86E-05	0	-1.33E-04
EP-terrestrial	mol N eq	3.93E-02	2.01E-03	1.14E-03	2.71E-06	1.06E-05	4.4E-04	0	-1.42E-03
POCP	kg NMVOC eq	1.18E-02	3.68E-04	8.5E-01	7.41E-07	1.94E-06	1.01E-04	0	-3.82E-04
ADPE	kg Sb eq	1.35E-05	5.39E-09	1.49E-07	1.62E-12	2.84E-11	7.82E-10	0	-6.03E-08
ADPF	MJ	1.59E+02	1.91E+00	2.52E+00	5.76E-04	1.01E-02	9.01E-02	0	-6.22E+00
WDP	m^3 world eq deprived	2.27E-01	3.79E-04	8.71E-02	1.14E-07	1.99E-06	2.37E-02	0	-3.81E-02

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 kg 1 kg of product based on vinyl chloride polymers

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	1.11E+01	9.64E-03	2.96E+00	2.9E-06	5.07E-05	1.54E-02	0	-1.36E+00
PERM	MJ	2.48E+00	0	-2.48E+00	0	0	0	0	0
PERT	MJ	1.35E+01	9.64E-03	4.79E-01	2.9E-06	5.07E-05	1.54E-02	0	-1.36E+00
PENRE	MJ	1.23E+02	1.92E+00	8.83E+00	5.78E-04	1.01E-02	2.22E+00	0	-6.22E+00
PENRM	MJ	3.56E+01	0	-6.3E+00	0	0	-2.13E+00	0	0
PENRT	MJ	1.59E+02	1.92E+00	2.52E+00	5.78E-04	1.01E-02	9.01E-02	0	-6.22E+00
SM	kg	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0
FW	m^3	1.92E-02	1.58E-05	2.34E-03	4.74E-09	8.29E-08	5.6E-04	0	-1.58E-03

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 kg 1 kg of product based on vinyl chloride polymers

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	7.6E-07	5.05E-10	8.36E-09	1.52E-13	2.66E-12	3.32E-10	0	-2.48E-09
NHWD	kg	1.92E-01	2.08E-04	1.15E-01	6.25E-08	1.09E-06	2.59E-02	0	-2.88E-03
RWD	kg	2.64E-03	3.16E-06	1.42E-04	9.5E-10	1.66E-08	3.95E-06	0	-4.65E-04
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0
EEE	MJ	0	0	1.35E+00	0	0	2.11E-01	0	0
EET	MJ	0	0	2.41E+00	0	0	3.95E-01	0	0

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

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg 1 kg of product based on vinyl chloride polymers

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	ND	ND	ND	ND	ND	ND	ND	ND
IR	kBq U235 eq	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	ND	ND	ND	ND	ND	ND	ND	ND
HTP-c	CTUh	ND	ND	ND	ND	ND	ND	ND	ND
HTP-nc	CTUh	ND	ND	ND	ND	ND	ND	ND	ND
SQP	SQP	ND	ND	ND	ND	ND	ND	ND	ND

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

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

ADP minerals & metals, ADP fossil, WDP, ETF-fw, HTP-c, HTP-nc, SQP, Disclaimer 2 – 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.

Additional environmental impact indicators shall be used with care as the uncertainties on these results are high and as there is limited experience with the indicator (see ILCD classification in EN 15804, table 5). For this reason, results based on these indicators are not considered suitable for a decision-making process.

6. LCA: Interpretation

The majority of impacts are associated with the production phase modules (A1-A3). The most significant contribution to the production phase impacts is the upstream production of raw materials as the main driver. A small contribution to the impact of the production phase is also given by the transport of raw materials and manufacturing. CO_2 is the most important contributor to the Global Warming Potential (GWP). For the Acidification Potential (AP) NO_x and SO_2 contribute to the largest share.
The majority of energy consumption takes place during the production phase (A1-A3). Significant contributions to Primary Energy Demand – Non-renewable (PENRT), come from the energy resources used in the production of raw materials. The largest contributor to Primary Energy Demand – Renewable (PERT) impacts comes from the consumption of renewable energy resources required for the generation and supply of electricity and the energy resources used for raw materials production as well as the energy resources used for packaging. It should be noted that PERT generally represents a small percentage of the production phase primary energy demand with the bulk of the demand coming from non-renewable energy resources.
Transportation to the construction site (A4) and the installation process (A5) have a relatively minor impact compared to other phases. However, the POCP category is an exception: the A5 module is significantly affected by VOC emissions during the installation phase. Additionally, this module influences the WDP category because of the process water used during waste treatment. The waste processing module (C3) is not significant for any impact category.

7. Requisite evidence

7.1 VOC
Special tests have not been carried out within the framework of drawing up this Model EPD. Some member states require special documentation on VOC emissions into indoor air for specific areas of application. This documentation, as well as documentation for voluntary VOC labelling, must be provided separately and is specific to the product in question.
Evidence pertaining to VOC emissions shall show
-either an attestation of compliance with, -or documentation of test data that is required in any of the existing regulations or in any of the existing voluntary labelling programs for low-emitting products, as far as these
(1) include limits for the parameters TVOC, TSVOC, carcinogens, formaldehyde,
acetaldehyde, LCI limits for individual substances (including but not limited to the European list of harmonized LCIs), and the R-value;
(2) base their test methods on *EN 16516*;
(3) perform testing and apply the limits after 28 days of storage in a ventilated test chamber, under the conditions specified in *EN 16516*; some regulations and programs also have limits after 3 days, on top of the 28 days limits;
(4) express the test results as air concentrations in the European Reference Room, as specified in EN 16516.
Examples of such regulations are the *Belgian Royal Decree C-2014/24239*, or the *German AgBB/ABG*. Examples of such voluntary labelling programs are *EMICODE*, *Blue Angel* or *Indoor Air Comfort*.
Relevant test results shall be produced either by an *ISO 17025* accredited commercial test lab or by a qualified internal test lab of the manufacturer. Examples for the applied limits after 28 days of storage in a ventilated test chamber are:
- TVOC: 1000 µg/m³
- TSVOC: 100 µg/m³
- Each carcinogen: 1 µg/m³
- Formaldehyde: 100 µg/m³
- LCI: different per substance involved
- R-value: 1 (meaning that, in total, 100 % of the combined LCI values must not be exceeded)

Informative Annexes (2 tables):
Table 1 shown below is an overview of the most relevant

regulations and specifications as of October 2024, as regards requirements after 3 days of storage in a ventilated test chamber.

Table 2 provides an overview of the most relevant regulations and specifications as of October 2024, as regards requirements after 28 days of storage in a ventilated test chamber. Some details may be missing in the table due to lack of space. Values given represent maximum values/limits.

	TVOC µg/m³	Sum of carcinogens. C1A,CA2 µg/m³	Formaldehyde µg/m³	Acetaldehyde µg/m³	Sum of Form- and Acetaldehyde
German AgBB/ABG regulation	10 000	10	-/-	-/-	-/-
Belgian regulation	10 000	10	-/-	-/-	-/-
EMICODE EC1	1 000	10	50	50	50 ppb
EMICODE EC1 *PLUS*	750	10	50	50	50 ppb

	TVOC µg/m³	TSVOC µg/m³	Each carcinogen C1A,CA2 µg/m³	Formalde-hyde µg/m³	Acetalde-hyde µg/m³	LCI	R value	Specials	Sum of non-LCI & non-identified µg/m³
Belgian regulation	1000	100	1	100	200	Belgian list	1	Toluene 300 µg/m³	-/-
French regulations class A+	1000	-/-	-/-	10	200	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class A	1500	-/-	-/-	60	300	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class B	2000	-/-	-/-	120	400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
French regulations class C	>2000	-/-	-/-	>120	>400	-/-	-/-	List of 8 VOCs, 4 CMR	-/-
German DIBt/AgBB regulation	1000	100	1	100	300	German AgBB list	1	-/-	100
EMICODE EC1	100	50	1	(after 3 days)	(after 3 days)	-/-	-/-	-/-	-/-
EMICODE EC1 *PLUS*	60	40	1	(after 3 days)	(after 3 days)	German AgBB list	1	-/-	40
Finnish M1, sealants	20	-/-	1	10	300	EU LCI list	-/-	Ammonia, odour	-/-
Finnish M1, adhesives	200 µg/m²h	-/-	5 µg/m²h	50 µg/m²h	300	EU LCI list	-/-	Ammonia, odour	-/-

7.2 Drinking water contact
Relevant for the applications is contact with drinking water. Adhesives positioned for contact with drinking water are evaluated if they are suitable for contact with drinking water. At the moment requirements and testing is organized by the separate EU member states. This will be replaced in the coming years by the EU Drinking Water Directive (*DWD*)

7.3 Leaching
The adhesive does not come into direct contact with soil. The adhesive is applied on the pipe-end and inside the fitting, after assembling the adhesive is enclosed between pipe and fitting. If there is an excess of adhesive it will be removed.

8. References

EN 2811-1
ISO 2811-1:2016, Paints and varnishes -Determination of density - Part 1: Pycnometer method

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

EN 14680
EN 14680:2015 / EN 14680:2006, Adhesives for non-pressure thermoplastic piping systems - Specifications

EN 14814
EN 14814:2016, EN 14814:2007 Adhesives for thermoplastic piping systems for fluids under pressure - Specifications

EN 16516
EN 16516:2017+A1:2020 Construction products – Assessment of release of dangerous substances - Determination of emissions into indoor air

EN ISO 17025
EN ISO 17025:2018-03 General requirements for the competence of testing and calibration laboratories

2000/532/EC
Commission decision dated 3 May 2000 replacing decision 94/3/EC on a waste directory in accordance with Article 1 a) of Council Directive 75/442/EEC on waste, and Council decision 94/904/EC on a directory of hazardous waste in terms of Article 1, paragraph 4 of Directive 91/689/EEC on hazardous waste

Belgian Royal Decree C-2014/24239
Belgisch Staatsblad 8 MEI 2014, p.60603. — Koninklijk besluittot vaststelling van de drempelniveaus voor de emissies naarhet binnenmilieu van bouwproducten voor bepaalde geoogde gebruiken

Blue Angel
Environmental label organised by the federal government of Germany www.blauer-engel.de

Candidate list
Candidate List of substances of very high concern for Authorisation, published in accordance with Article 59(10) of the REACH Regulation, ECHA, www.echa.europa.eu/candidatelist-table

CPR
CPR Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

Decopaint Directive
Directive 2004/42/CE of the European Parliament and the Council of 21 April 2004 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC

EMICODE
EMICODE, GEV – Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e. V. (pub.).www.emicode.de

EWC waste code
Directive governing introduction of the European WasteCatalogue

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Sphera Solutions, 'Life Cycle Assessment for Expert software', Sphera Solutions, Chicago, US, 2024. Retrieved from https://sphera.com/life-cycle-assessment-lca-software/

Sphera Managed Lifecycle Content (MLC) Sphera Solutions, Managed LCA content dataset documentation, Sphera Solutions, Chicago, US. Retrieved from https://sphera.com/product-sustainability-gabi-data-search/

German AgBB
Committee for Health-related Evaluation of Building Products:health-related evaluation of emissions of volatile organic compounds (VOC and SVOC) from building products; status:June 2024
www.umweltbundesamt.de/produkte/bauprodukte/agbb.htm

IBU 2022
Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V. EPD programme. Version 2.1. Berlin: Institut Bauen und Umwelt e.V., 10-2022 www.ibu-epd.com

Indoor Air Comfort
Product certification by Eurofins, Galten, Denmarkwww.eurofins.com

IBU PCR Part A
Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. Version 1.4, 04-2024 www.ibu-epd.de

PCR Part B
Product Category Rules for Construction Products, Part B: Coatings with organic binders v.11, Institut Bauen und Umwelt e.V., 2024-08

REACH
Directive (EG) No. 1907/2006 of the European Parliament and of the Council dated 18 December 2006 on the registration, evaluation, approval and restriction of chemical substances (REACH), for establishing a European Agency for chemical substances, for amending Directive 1999/45/EC and for annulment of Directive (EEC) No. 793/93 of the Council, Directive (EC) No. 1488/94 of the Commission, Guideline76/769/EEC of the Council and Guidelines 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC of the Commission

Directive (EG)
No. 1907/2006 of the European Parliament and of the Council dated 18 December 2006 on the registration, evaluation, approval and restriction of chemical substances (REACH), for establishing a European Agency for chemical substances, for amending Directive 1999/45/EC and for annulment of Directive (EEC) No. 793/93 of the Council, Directive (EC) No. 1488/94 of the Commission, Guideline 76/769/EEC of the Council and Guidelines 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC of the Commission.

DWD
DG Environment, in preparation, https://echa.europa.eu/understanding-dwd

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