ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	BOSTIK GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-BOS-20240136-CCA2-EN
Issue date	27.08.2024
Valid to	26.08.2029

R3BOND® System adhesive

BOSTIK

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

www.ibu-epd.com | https://epd-online.com

1. General Information

BOSTIK

Programme holder

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

Declaration number

EPD-BOS-20240136-CCA2-EN

This declaration is based on the product category rules:

Dispersion adhesives and primers for floor coverings, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

27.08.2024

Valid to

26.08.2029

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

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

R3BOND® System adhesive

Owner of the declaration

BOSTIK GmbH
Postfach 11 54
33825 Borgholzhausen
Germany

Declared product / declared unit

1 kg of R3BOND® System adhesive product

Scope:

The Environmental Product Declaration refers to R3BOND® System adhesive product. Data and calculation values refer to the BOSTIK plant located in Avelin in France. It is based on data from 2022 which complies with the annual average.
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

Vito D'Incognito,
(Independent verifier)

2. Product

2.1 Product description/Product definition

R3BOND® System adhesive is a soft floor adhesive to glue down resilient flooring like PVC. Its compositions is a formulation of latex polymers with mineral fillers, polymer binders, and various additives.

This system made of a specific adhesive and a mesh allow to glue down all kind of PVC flooring and their removal post use without any mark of adhesives or inorganic elements on the backing (Internal testing of castor chair according to *EN 425*). This allows PVC flooring to be recycled by flooring manufacturers without any additional chemical or physical treatment to remove residues from the backing.

This system also allows to recover a clean subfloor at the renovation phase without any damage or adhesive residues. A resilient flooring can then be reapplied directly on the clean subfloor without any additional floor preparation.

This system will have to be applied on a reinforced cement based self levelling compound recommended by Bostik of minimum C30 according to *ISO 1920-4*, with a min thickness of 3mm up to 20 mm applied on a waterbased primer to ensure good adherence of the self leveling compound on the cement screed.

There are no harmonised legal provisions at EU level for the use and application of these products. French national provisions therefore apply.

2.2 Application

Before the application of the R3BOND® System, floor preparation must be done thanks to Bostik guidelines and product recommendation.

The R3BOND® System is an innovative adhesive system for PVC flooring made of a specific adhesive and a mesh. At the application phase, the adhesive is applied on the top of the mesh with a standardised trowel (A2 model) to ensure the minimum consumption. The PVC covering is then applied after a waiting time of 15 minutes. According to the technical data sheet, fresh glue stains and tools are cleaned with water.
At the renovation phase the PVC flooring can be removed easily without any residue on the backing for recycling in the traditional PVC flooring manufacturers' channels. The mesh is then removed from the subfloor to recover a clean subfloor ready for an application of a new PVC flooring without additional floor preparation.

This EPD covers the "R3BOND® System adhesive" only, and the impacts of the complete system adhesive and grid together are shared in Annex of this EPD.

2.3 Technical Data

R3BOND® System adhesive complies with the requirements of *EN ISO 22636* on PVC flooring. The values obtained in the tests defined by standards *EN ISO 2263*, *EN ISO 22636* (peel test) and *ISO EN 22632* (shear test) are higher than the values indicative of the performance of adhesives specified in standard *EN ISO 22636*.
Other relevant technical data can be found in the Bostik technical documentation available on the Bostik website: https://bostiksdsinternal.thewercs.com/

Constructional data

Name	Value	Unit
Peel strength acc. to EN ISO 22631	greater than 1.2	N/mm
Shear strength acc. to EN ISO 22632	greater than 0.3	N/mm^2
Dimensional changes acc. to EN ISO 22633		max. %

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

2.4 Delivery status

The R3BOND® System adhesive is delivered in 13L PP buckets.

2.5 Base materials/Ancillary materials

The R3BOND® System adhesive is a formulation of latex polymers with mineral fillers, polymer binders, and various additives (e.g.preservatives, defoaming agents).

This formulation contains 75% of biobased carbon as a fraction of total carbon contained.

The R3BOND® System adhesive is a low volatile organic compounds (VOC) emission product. It contributes to preserving the indoor air quality of the buildings.
It's classified: EC 1 PLUS EMICODE for Installation Products, Adhesives and Building materials, It contributes to BREEAM International and BREEAM NOR, LEED v4 and v4.1 BETA.
Cf. Report *Eurofins* n°392-2022-00251002_G_EN and n°392-2022-00251003_XG_EN of the 10th August 2022.

***REACH* regulation:**

1. This product contains substances listed in the candidate list (date: 01.03.2024) exceeding 0.1 percentage by mass: YES. The substances are an antioxidant CAS n °68610-51-5 (at 0.35%) and sodium hydroxide CAS n °1310-73-2 (at 0.2%).
2. This product contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: NO.
3. Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): YES. The biocide included in this product is: benzisothiazolone (In- can preservative).

Bostik products have safety data sheets that can be consulted at: https://bostiksds.thewercs.com/default.aspx

For Bostik, substances, contained in the R3BOND® System adhesive product, which incorporate more than 0.1% according to the candidate list of the *REACH* regulation, are indicated in chapters 3 and 15 of the Safety Data Sheet.

In this study, Bostik R3BOND® System adhesive product does not contain SVHC > 0.1%. The latest version of the SDS is available at:
https://bostiksdsinternal.thewercs.com/MyDocuments/DownloadSingleF
ontent=DDBB71A5-0D69-4207-B52D-
A4C8C6BF7F45_PDF&Auth=PDF&excel=true

2.6 Manufacture

The raw materials, supplied in bags, big bags or tanks, are stored in the warehouse and added automatically or manually in the mixer according to the recipe. The product is mixed discontinuously in batch mode and filled in the PP buckets. The buckets are then put on wooden pallets together with the R3BOND® grid according to orders, wrapped in PP film and stored in the finished product warehouse.
The manufacturing plant of Bostik SA – Plant Avelin, France, is certified according to *ISO 14001* which defined international standards for sustainable environmental management.

2.7 Environment and health during manufacturing

Apart from the customary measures concerning hygiene and safety in the workplace, no particular protective measures need to be observed during production.

2.8 Product processing/Installation

First the R3BOND® System grid is positioned on the floor. The R3BOND® System adhesive is applied manually with a standardized trowel which guarantees a quantity of adhesive applied of between 400 and 450 g/m² (according to the European standard TKB - trowel model: type A2).
A gap of 5 mm needs to be kept between each R3BOND® grip lines. The mesh must be placed perpendicularly to the PVC roll or in parallel to LVT flooring.
No additional energy or substances (water or solvents) are required for the assembly of the R3BOND® System.

2.9 Packaging

The R3BOND® System adhesive is packed in PP buckets and placed into a wood pallet and shrinked with a PP film.
Materials for packaging (for 1kg of product):

Packaging materials	Value	Unit
Wood	0,001	kg/ kg of product
Plastic (PP)	3,47E-02	kg/ kg of product

2.10 Condition of use

No environmental impact is incurred by the product during use.

2.11 Environment and health during use

The R3BOND® System adhesive is classified:
- EC 1 PLUS EMICODE for Installation Products, Adhesives and Building materials,
- BREEAM International and BREEAM NOR,
- LEED v4 and v4.1 BETA
(Test Reports of *Eurofins* n°392-2022-00251002_G_EN and n °392-2022-00251003_XG_EN dated of the August 10, 2022).

The R3BOND® System (Adhesive + grid) is classified:
- EC 1 PLUS EMICODE for Installation Products, Adhesives and Building materials,
- BREEAM International and BREEAM NOR,
- LEED v4 and v4.1 BETA
(Test report of *Eurofins* n°392-2022-00251001_G_EN dated of August 10, 2022).

2.12 Reference service life

The service life of dispersion adhesive products depends on their uses.
According to the *BBSR* table "Service lives of components for life cycle assessment according to BNB", the service life of Dispersion products is 15 years.
https://www.nachhaltigesbauen.de/austausch/nutzungsdauern-von-bauteilen/

Description of the influences on the ageing of the product when applied in accordance with the rules of technology.

2.13 Extraordinary effects

Fire
There are no normative requirements on fire safety for this product. The product has not been fire tested.
Water
When exposed to water, the bond between the floor and the covering can be reduced by the adhesive layer dissolving. No substances are washed out which could be hazardous to water.

Mechanical destruction
Not of relevance.

2.14 Re-use phase

Thanks to the combination of the adhesive and the grid, the PVC flooring can be removed easily without any residue of glue on the back of the flooring or on the substrate.
The PVC coating, which is free of glue and levelling compound, can be recycled post use in the traditional manner of PVC flooring manufacturer's channels without any additional physical or chemical treatment.

2.15 Disposal

The detached R3BOND® System adhesive + R3BOND System grid are considered as non-hazardous waste and sent to landfill. The *EWC* waste code in accordance with the European Waste Catalogue / List of Waste Ordinance (AVV) is 08 04 16 (aqueous, liquid dispersion residue) and 08 04 10 (cured dispersion waste).

2.16 Further information

https://www.bostik.com/global/en/

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to the declared unit of 1 kg of R3BOND® System adhesive, applied into the building in accordance with the IBU PCR part B for Dispersion adhesives and primers for floor coverings.

The R3BOND® System adhesive is applied manually with a standardized trowel (according to the European standard TKB type A2) which guarantees a quantity of adhesive applied of between 400 and 450 g/m² (0.43 kg/m² considered in the R3BOND® System functional unit declaration in Annex).

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	kg
Productiveness (functional unit)	0.43	kg/m^2
Gross density	1.05	kg/m^3

3.2 System boundary

This LCA is published as a cradle-to-grave EPD, according to the *EN15804* and includes the modules A1-A3, A4, A5, C1, C2, C3, C4 and D:
• A1 Extraction/ production of raw materials, packaging and

auxiliaries,
• A2 Transport of the raw materials to the plant,
• A3 Production, including energy, auxiliaries, packaging and waste treatment.

According to the *EN15804+A2*, modules A1, A2 and A3 are declared as an aggregated module A1-A3.
• A4 Transport of the product to the construction site,
• A5 Product installation into the building, with packaging waste disposal (landfilling commercial waste),
• C1 deconstruction, demolition, [manually]
• C2 Transport to waste processing,
• C3 waste processing for reuse, recovery and/or recycling, [not applicable in this study]
• C4 product landfilling,
• D Credits from incineration of packaging materials.

3.3 Estimates and assumptions

Production waste is considered to be disposed of by incineration with energy credits, while assembly waste and end-of-life disposal are considered to be landfilled as most representative scenarios. The biogenic carbon emissions are still considered as specified in *EN15804*.
Although the buckets are made from recycled PP due to the lack of associated LCA data a standard virgin PP dataset is considered.

3.4 Cut-off criteria

All energy flows identified related to the Bostik manufacturing workshop and raw material manufacturing have been considered.

3.5 Background data

For the background dataset, the information about the documentation is available in Gabi documentation on-line:
https://sphera.com/product-sustainability-gabi-data-search/

3.6 Data quality

Primary data of Bostik refer to the year 2022 and represent the complete annual production.

Transport, manufacturing utilities and raw materials data come from European and global databases, as well as supplier EPD for some raw materials. All dataset included have a temporary reference between 2020 and 2023, except an additive from 2008. Therefore all datasets are not more than 10 years old according to *EN 15804+A2* data quality requirements.

The quality level of the datasets used in this EPD can be considered 'good' or 'fair' according to *EN 15804*.

3.7 Period under review

Data of the plant = year 2022.
Split (ratio) of raw materials supplier 2023.

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

The manufacturing of acrylic adhesive products doesn't generate co-products. All inputs and outputs are taken into account in this study. Electricity is measured at the entrance of the plant and allocated to each workshop and product following distribution key established by the experts of each workshop and the accounting department.

Waste and emissions are measured at the exit of the plant and allocated to each workshop by process managers following the nature of the waste and the tonnage of each workshop. When specific waste are identified for a specific workshop, no allocation is applied.

Acrylic adhesive products have no considerable benefits due to recycling or/and reuse.
The incineration credits (electrical and thermal) of the A3 production waste are considered and included in the calculation.

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.
The background database is used from LCA for Experts, Gabi® 2023.1.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The R3BOND® System adhesive contains 75% of biobased carbon as a fraction of total carbon.
(Product tested by *Eurofins*, report n°392-2022-00273301_FP_EN of the 06/30/2022)

Information on describing the biogenic carbon content at factory gate

For 1kg of R3BOND® System adhesive:

Name	Value	Unit
Biogenic carbon content in product as a fraction of total carbon	0.074	kg C
Biogenic carbon content in accompanying packaging	0.00043	kg C

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

The biogenic carbon of the packaging comes only from the wood pallet. To calculate the biogenic content of wood, the *EN 16449: 2014* (May 2014) standard has been used.
The use of packaging material is declared in the module A3.
The amount of packaging materials as waste in step A5 was included and the "commercial waste incineration" module has been used to declare the disposal.

The emissions of biogenic carbon are manually added at the end of life of the product (step C4).

Transport to the building site (A4)

Name	Value	Unit
Transport distance	1000	km
Capacity utilisation (including empty runs)	55	%
Capacity utilisation volume factor	17.3	-

Installation into the building (A5)

The R3BOND® System is applied by hand, using a spatula for the adhesive and scissors for the grid. No energy or substances (water or solvents) are required for this step.

For 1kg of R3BOND® System adhesive:

Name	Value	Unit
Material loss	0.005	kg

Use or application of the installed product (B1) see section 2.12 "Use"

The product is not in direct contact with the outside. No maintenance, use, repair or replacement is required.

Name	Value	Unit

- The reference service life (RSL) cannot be declared according to *EN ISO 15686*.

- The service life of acrylic adhesive dispersion is reported to be between 7 to 20 years, depending on its applications as assessed by our technical and marketing teams.

- According to the *BBSR* table "Service lives of components for life cycle assessment according to *BNB"*, the service life of dispersion products is 15 years (https://www.nachhaltigesbauen.de/austausch/nutzungsdauern-von-bauteilen/)

Reference service life

Name	Value	Unit
Life Span (according to BBSR)	15	a
Life Span according to the manufacturer	20	a

End of life (C1-C4)

The product is removed manually without energy or auxiliaries required.

Name	Value	Unit
Landfilling	0.995	kg

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

The R3BOND® System adhesive is neither recycled or reused by itself.
The R3BOND® System facilitates the recycling of the PVC flooring. However, such benefits are not included in this EPD.

Name	Value	Unit

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 R3BOND® System adhesive

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	4.71E-01	1.04E-01	4.49E-02	0	1.72E-02	0	3.72E-01	-2.38E-02
GWP-fossil	kg CO_2 eq	7.94E-01	1.03E-01	5.01E-03	0	1.7E-02	0	1.5E-02	-2.37E-02
GWP-biogenic	kg CO_2 eq	-3.33E-01	3.9E-04	3.98E-02	0	6.48E-05	0	3.4E-01	-5.83E-05
GWP-luluc	kg CO_2 eq	9.75E-03	9.59E-04	8.13E-06	0	1.59E-04	0	4.64E-05	-9.15E-07
ODP	kg CFC11 eq	4.71E-09	9.07E-15	3.13E-15	0	1.51E-15	0	3.8E-14	-1.21E-13
AP	mol H^+ eq	5.1E-03	6.37E-04	1.53E-05	0	1.31E-04	0	1.06E-04	-2.1E-05
EP-freshwater	kg P eq	1.82E-04	3.78E-07	7.83E-07	0	6.28E-08	0	3.01E-08	-1.64E-08
EP-marine	kg N eq	9.43E-04	3.12E-04	1.2E-05	0	6.51E-05	0	2.74E-05	-8.53E-06
EP-terrestrial	mol N eq	1.97E-02	3.46E-03	6.68E-05	0	7.2E-04	0	3.01E-04	-9.14E-05
POCP	kg NMVOC eq	3.87E-03	5.91E-04	2.73E-05	0	1.22E-04	0	8.27E-05	-2.35E-05
ADPE	kg Sb eq	8.95E-07	6.68E-09	9.37E-11	0	1.11E-09	0	6.89E-10	-1.01E-09
ADPF	MJ	1.95E+01	1.41E+00	3.59E-02	0	2.34E-01	0	1.99E-01	-6.62E-01
WDP	m^3 world eq deprived	1.1E+00	1.19E-03	1.56E-04	0	1.98E-04	0	1.64E-03	-1.13E-03

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 R3BOND® System adhesive

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	4.3E+00	9.97E-02	3.15E-03	0	1.66E-02	0	3.24E-02	-1.13E-03
PERM	MJ	ND	ND	ND	ND	ND	ND	ND	ND
PERT	MJ	3.97E+00	9.97E-02	3.15E-03	0	1.66E-02	0	3.24E-02	-8.13E-02
PENRE	MJ	2.62E+01	1.41E+00	3.59E-02	0	2.35E-01	0	1.99E-01	-6.62E-01
PENRM	MJ	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	MJ	1.95E+01	1.41E+00	3.59E-02	0	2.35E-01	0	1.99E-01	-6.62E-01
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND
FW	m^3	1.21E-01	1.19E-03	1.56E-04	ND	ND	ND	ND	ND

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 R3BOND® System adhesive

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	4.52E-06	5.22E-12	2.13E-12	0	8.69E-13	0	4.34E-12	-2.93E-11
NHWD	kg	1.99E-02	2.04E-04	2.69E-02	0	3.38E-05	0	9.96E-01	-1.76E-04
RWD	kg	4.61E-04	1.83E-06	3.35E-07	0	3.04E-07	0	2.27E-06	-1.01E-04
CRU	kg	ND	ND	ND	ND	ND	ND	ND	ND
MFR	kg	ND	ND	ND	ND	ND	ND	ND	ND
MER	kg	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	ND	ND	ND	ND	ND	ND	ND	ND
EET	MJ	ND	ND	ND	ND	ND	ND	ND	ND

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 R3BOND® System adhesive

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	7.74E-08	4.01E-09	1.33E-10	0	8.13E-10	0	1.3E-09	-1.89E-10
IR	kBq U235 eq	1.53E-01	2.63E-04	4.95E-05	0	4.38E-05	0	2.62E-04	-2.59E-02
ETP-fw	CTUe	8.52E+00	9.83E-01	5.49E-02	0	1.63E-01	0	1.09E-01	-1.53E-01
HTP-c	CTUh	3.03E-10	2.01E-11	1.51E-12	0	3.34E-12	0	1.67E-11	-4.13E-12
HTP-nc	CTUh	1.02E-08	1.26E-09	1.56E-10	0	2.12E-10	0	1.84E-09	-1.27E-10
SQP	SQP	1.24E+02	5.88E-01	6.48E-03	0	9.77E-02	0	4.83E-02	-3.33E-02

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

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

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

This EPD was created using a software tool.

6. LCA: Interpretation

The majority of impacts comes from the production phase A1-A3. Considering the Global Warming Potential (GWP-total) the impacts are spread evenly over the 3 stages A1, A2, and A3. Compared to standard flooring products the impact in A1 is significantly reduced through the presence of bio-based raw material, while A2 and A3 are at similar level. The impact of stage A3 is directly linked to France's low-carbon electricity mix.

The production phase concentrates also the main impacts for the Water depletion (WDP) and (GWP-luluc) mostly due to the bio-based raw materials.

Transportation to the construction site (A4) and the installation process (A5) have a low contribution to all impacts.

The end-of-life phases makes a contribution mostly on the Global Warming Potential (GWP), as biogenic carbon emissions are accounted for thought the product is considered inert.

7. Requisite evidence

The emissions of the BOSTIK R3BOND® System products have been tested by *Eurofins* in accordance with the standards approved by the various *BREEAM*, *EMICODE* and *LEED* protocols.
The results comply with the requirements defined in each program.

Total volatile organic compounds (*TVOC*) limit values EMICODE
Test institute: *Eurofins* Product Testing A/S, 8464 Galten, Denmark
Measuring process: GEV test method for determining the emissions of volatile organic compounds from building products according to *ISO 16000-11* in a test chamber.
Testing for CMR substances and TVOC/TSVOC after 3 and 28 days.

µg/m³		EC 1 PLUS	EC 1	EC 2
TVOC after 3 days	≤	750	1.000	3.000
TVOC after 28 days	≤	60	100	300
Formaldehyde after 3 days	≤	50	50	50
Acetaldehyde after 3 days	≤	50	50	50
Sum of form- and acetaldehyde after 3 days	≤	0.05 ppm	0.05 ppm	0.05 ppm

***AgBB* scheme**
Health-related evaluation of emissions by volatile organic compounds (VOC and SVOC) from construction products.
The requirements on emission performance according to AgBB are automatically regarded as satisfied for products availing of EMICODE EC 1 PLUS classification.

LEED (Leadership in Energy and Environmental Design)
An US Green Building Council program to evaluate the construction industry on various criteria: Reduction of waste and resources used, Reuse of materials and Recycling of materials (on a total of 110 points).
The certification is classified into 4 levels: Certified (40 to 49 points), Silver (50 to 59), Gold (60 to 79) or Platinum (> 80 points).
For the VOC emissions specifications in LEED EQ credit (Low-Emitting Materials" for LEED projects outside the US:
The requirements of LEED v4.1 BETA (02.2021) do not exceed the LCI values mentioned in the AgBB scheme: TVOC ≤1.000 µg/m3 (*EN 16516*), a sum of VOC without LCI <100 µg/m3 and a formaldehyde emission ≤10 µg/m3 all after 28 days. The requirements of LEED v4 must be complied with the

requirements of EMICODE (EC1 PLUS), version of 04/2020, with the additional formaldehyde limit <10 µg/m3 after 28 days.
For the VOC content specifications in LEED EQ credit "Low-Emitting Materials" for LEED projects globally:
The requirements of LEED v4 and v4 BETA (02.2021) for multipurpose construction adhesive must have a VOC content <70 g/L (according to SCAQMD Rule 1168 of 2017).

BREEAM (Building Research Establishment Environmental Assessment Method)
The product is complied with BREAM International with Exemplary criteria on VOC emission: New Construction 2021, Technical Manual - SD250: Hea 02 Indoor Air Quality (v6.0 of 12.2021).

The product is complied with BREAM NOR with Exemplary criteria on VOC emission: New Construction 2022, Technical Manual - SD5076NOR: Hea 02 Indoor Air Quality (v6.0 of 02.2022).

R3BOND® System adhesive is classified:
- **EC 1 PLUS EMICODE** for Installation Products, Adhesives and Building materials,
- **Silver** for **LEED v4** and **v4.1 BETA:** "Product complies with VOC emissions specifications in LEED EQ credit "Low-Emitting Materials" for LEED projects outside the US and VOC content specifications for global projects".- Compliant with **BREEAM International** and **BREEAM NOR**,

Report *Eurofins* n°392-2022-00251002_G_EN and n°392-2022-00251003_XG_EN dated 10 August 2022.

R3BOND® System (adhesive + grid) is classified:
- **M1 EMICODE** for Installation Products, Adhesives and Building materials,

Report *Eurofins* n°392-2022-00251004_I_EN dated 10 August 2022.

AgBB overview of results (28 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	≤ 1.000	µg/m^3
Sum SVOC (C16 - C22) without LCI	< 100	µg/m^3
Carcinogenic Substances Formaldehyde substance	< 10	µg/m^3

8. References

Standards

EN 15804
EN 15804:2012+A1 2013, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

EN 15804
EN 15804:2012+A2:2019 +AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

ISO 14001
EN ISO 14001:2015, Environmental management systems — Requirements with guidance for use.

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

ISO 14040
EN ISO 14040:2006, Environmental management – Life cycle assessment – Principles and framework.

ISO 14044
EN ISO 14044:2006, Environmental management – Life cycle assessment – Requirements and guidelines (ISO 14044:2006); German and English versions EN ISO 14044:2006.

Further References

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

DIN EN ISO 16000-11
DIN EN ISO 16000-11:2006-06, Indoor air – Part 11: Determination of the emission of volatile organic compounds from building products and furnishings – Sampling, storage of samples and preparation of test specimens.

DIN EN ISO 22631
DIN EN ISO 22631:2019, Adhesives - Test method for adhesives for floor and wall coverings - Peel test.

DIN EN ISO 22632
DIN EN ISO 22632:2019, Adhesives - Test method for adhesives for floor and wall coverings - Shear test.

DIN EN ISO 22633
DIN EN ISO 22632:2019, Adhesives - Test methods for adhesives for floor coverings and wall coverings - Determination of dimensional changes of a linoleum floor covering in contact with an adhesive.

AgBB
AgBB: German Committee for Health-Related Evaluation of Construction Products Health-related
evaluation of emissions by volatile organic compounds (VOC and SVOC) from construction products; valid as of June 2012.
www.umweltbundesamt.de/produkte/bauprodukte/agbb.htm

BREEAM International
BREEAM is the world's leading sustainability assessment method for master planning projects, infrastructure and buildings. The tested product complies with the requirements of BREEAM International: New Construction 2016, Technical Manual: Hea 02 Indoor air quality (version SD233 issue 2.0 of July 2017).

ecoinvent
ecoinvent 3.8: Life Cycle Inventory Database (Life Cycle Inventory Data), Version 3.8.

Eurofins
Eurofins Product Testing A/S in Denmark; Denomination test: Determination of radiocarbon content according to ASTM D6866.
www.eurofins.dk/dk/product-testin

European Waste Code (EWC)
European Waste Catalog established by Commission decision 2000/532/EC.
http://www.environment-agency.gov.uk/

GaBi - Sphera documentation
Gabi documentation is available on the website:
https://sphera.com/product-sustainability-gabi-data-search/

GEV/EMICODE
GEV – Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e. V., Düsseldorf; www.emicode.de/

IBU 2021

General Instructions for the EPD program of Institut Bauen und Umwelt e.V. Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021. www.ibu-epd.com. www.ibu-epd.com

IBU PCR Part A
Calculation Rules for the Life Cycle Assessment and Requirements on the Project report according to EN 15804+A2:2019– PCR 2020, Version 1.3 Part A: 2022-08-31.

The literature referred to in the Environmental Product Declaration must be listed in full.Standards already fully quoted in the EPD do not need to be listed here again.
The current version of PCR Part A and PCR Part B of the PCR document on which they are based must be referenced.

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