ENVIRONMENTAL PRODUCT DECLARATION

in accordance with *ISO 14025* and *EN 15804+A2*

Declaration owner	Meesenburg Großhandel KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-MEN-20230044-IBE1-DE
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Valid to	13/04/2028

blaugelb Plinth Thermal Insulation Profile EPS

Meesenburg Großhandel KG

Institut Bauen und Umwelt e.V.

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ECO PLATFORM EPD VERIFIED

1. General Information

Meesenburg Großhandel KG

Programme holder

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

Declaration number

EPD-MEN-20230044-IBE1-DE

This declaration is based on the Product Category Rules:

Insulating materials made of foam plastics, 01.01.0001
(PCR checked and approved by the independent Advisory Board (SVR))

Issue date

14/04/2023

Valid to

13/04/2028

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

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

blaugelb Plinth Thermal Insulation Profile EPS

Owner of the declaration

Meesenburg Großhandel KG
Westerallee 162
24941 Flensburg
Germany

Declared product/declared unit

1 m³ blaugelb Plinth Thermal Insulation Profile EPS

Scope:

This Environmental Product Declaration applies to the declared unit of 1 m³ blaugelb Sill Connection Profile EPS with a bulk density of 150 kg/m³, distributed by Meesenburg Großhandel KG. The life cycle assessment is representative for 100 % of the products.

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 evidence.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will simply be referred to as *EN 15804*.

Verification

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

M. Schulz
Matthias Schulz,
Independent verifier

Petra E. M. Bosch * Lindenstraße 32 - 73111 Lauterstein-Nenningen * Vom Landgericht Ulm öffentlich bestellte und beeidigte Urkundenübersetzerin der französischen, italienischen und englischen Sprache für Baden-Württemberg

2. Product

2.1 Product description/product definition

In this Environmental Product Declaration (EPD), blaugelb Plinth Thermal Insulation Profiles EPS made of a high-density EPS (expanded polystyrene) from Meesenburg Großhandel KG are declared.

The blaugelb Plinth Thermal Insulation Profile EPS offers heat and moisture protection on front and balcony doors made from wood, wood/aluminium, aluminium and plastic.
It enables thermal separation and reduces the potential thermal bridges of conventional plastic profiles with steel reinforcement.

Regulation (EU) No. 305/2011 (CPR) applies for placing the product on the market in the EU/EFTA (with the exception of Switzerland).
The product requires a Declaration of Performance, taking into consideration *DIN EN 13163:2017-02, Thermal insulation products for buildings – Factory made expanded polystyrene (EPS) products* and the CE marking.

The respective national provisions and certifications apply for the use of the products. The certifications in Germany include in particular specifications of the rated value of the thermal conductivity and on the fire behaviour, as well as *DIN 4108-10:2021-11, Thermal insulation and energy economy in buildings – Application-related requirements for thermal insulation materials*, for factory-made thermal insulation products with the minimum requirements for the individual areas of application.

2.2 Application

The blaugelb Plinth Thermal Insulation Profile EPS was developed specifically for installation as a floor recess profile under lifting/sliding doors and threshold systems as well as for special structures with high load transfer. By virtue of the dovetail joint, the blaugelb Plinth Thermal Insulation Profiles EPS can be positively interlocked, to create any desired length.

The main application areas for the blaugelb Plinth Thermal Insulation Profile EPS products declared here are:

- Floor-level elements installation situation – window frame
- Floor-level elements installation situation – threshold
- Floor-level elements installation situation – lifting/sliding door
- In the area of floor-level connections with high requirements on strength, pressure resistance and insulating properties
- Insulation of door connections (e.g. steel girders, concrete supports)
- Insulation of critical areas (e.g. in wood-aluminium, aluminium and PVC systems)

2.3 Technical data

The following technical (construction) data in the delivery status are relevant for the declared product:

Construction data

Name	Value	Unit
Fire behaviour acc. to EN 13501-1	Euroclass E	
Water absorption during long-term immersion, Wlt [%] acc. to EN 12087	≤ 0.5	%
Discharge of hazardous substances into the interior of the building	NPD	
Heat transfer resistance R [m²K/W] acc. to EN 12667	0.5125	m²K/W
Thermal conductivity, λ (10) acc. to EN 12667	0.0403	W/m*K
Water vapour permeability: Water vapour diffusion resistance factor (μ) acc. to EN 12086	228	μ
Air permeability acc. to EN 12207	Class 4	
Compression stress (2 %) compression acc. to EN 13163/EN 826	≥ 1435	kPa
Compressive strength: Compression stress at 10 % compression [kPa] acc. to EN 826	2090	kPa
Compressive strength: Deformation under defined compressive and temperature stress at 40 kPa, 70 °C and 168 h, DLT 5 acc. to EN 1605	< 0.4	%
Bending strength acc. to DIN EN 12089	2490	kPa
Shear strength acc. to ISO 14130	0.217	N/mm²
Durability of fire behaviour under the influence of heat, weathering, ageing/degradation, resistance properties	NPD	
Durability of the heat transfer resistance, resistance properties	Satisfied	
Dimensional stability under defined temperature and humidity conditions acc. to EN 1604	DS(70,-)1	
Dimensional stability in normal climatic conditions acc. to EN 1603	DS(N-)5	
Stability of the pressure resistance against ageing/degradation, creep behaviour	NPD	
Stability of the pressure resistance against ageing/degradation, freeze/thaw cycling	NPD	
Compressive load bearing capacity at max. total deformation of 2 %	1260	kg/dm²
Water absorption after 28 days under water acc. to EN 12087	≤ 0.5	vol. %

NPD = no performance determined

Performance values of the product corresponding to the Declaration of Performance with regard to its essential characteristics in accordance with *DIN EN 13163:2017-02, Thermal insulation products for buildings – Factory made expanded polystyrene (EPS) products.*

The external monitoring through removal from the factory as well as the certification are performed by testing, monitoring and certification bodies approved by the building inspectorate.

- Static evaluation of the thermal conductivity according to standards and test reports from the materials testing institute MPA BS (*EN 13163, ISO 10456)*
- Air permeability Class 4 according to *EN 12207*

- Airborne sound insulation according to *ISO 717-1* (with an area of 0.8 m²)
- Sound insulation – *ISO 10140-2* MFPA Leipzig GmbH
- Fire safety – GAS MPA Braunschweig
- Technical data sheets for all offered mounting materials
- Compatibility with adjacent building materials

2.4 Delivery status

The dimensions comply with the approval documents. Standard dimensions: Length 1175 to 1200 mm, depth of 50 to 90 mm, height of 30 to 400 mm. Other dimensions are possible.

2.5 Base materials/ancillary materials

The polymeric base product for styrofoam or rigid EPS foam is polystyrene (PS). It is manufactured through the polymerisation of monomer styrene using various methods.

The most frequently used method is the polymerisation in a styrene-water suspension, in which the propellant pentane is added toward the end of the polymerisation. The PS granulate created in this manner is processed further into foam in subsequent physical processing steps.

The base substance for manufacturing insulation is supplied in the form of bead-shaped granulate to the insulation manufacturer, where it is physically transformed/foamed and reworked.

Composition of silver-grey expanded polystyrene for blaugelb Plinth Thermal Insulation Profiles EPS for the application areas of these construction panels:

Portion in % w/w: 89 %
Pentane (referring to the % w/w in the raw material): 4.5 %
Miscellaneous (e.g. graphite) in % w/w: 6.5 %

The pentane added for foaming is a C5 hydrocarbon. The pentane is broken down during the manufacturing and storage processes.

To improve the insulating effect, graphite or alternatively carbon black is added to the product. This changes the reflection and absorption behaviour of the thermal radiation, which improves the insulating effect of the product with small layer thicknesses.

Polymer FR is used as a flame retardant. Polymer FR is a brominated styrene/butadiene copolymer.

The product/creation/at least one partial product contains substances from the ECHA candidate list of Substances of Very High Concern (SVHC) for authorisation (10/06/2022) above 0.1 % w/w: No.

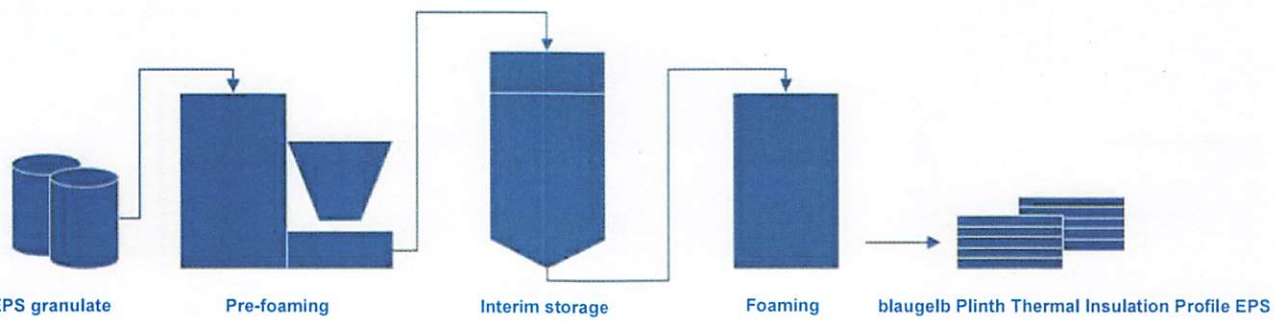
The product/creation/at least one partial product contains additional CMR substances of category 1A or 1B that are not on the candidate list above 0.1 % w/w in at least one partial product: No.

Biocidal products were added to this construction product or it was treated with biocidal products (this is a treated product within the meaning of the Biocidal Products Regulation (EU) No. 528/2012): No.

2.6 Manufacturing

During pre-foaming, the EPS granulate is pre-foamed to the final bead size using the contained propellant pentane and by means of steam. The pre-foamed EPS beads are then put into interim storage for a time in ventilated silos.

After the given storage time, the pre-foamed EPS is transported to the moulded part machine where the beads are pressurised and then fused by feeding in steam. Following the cooling phase, the blaugelb Plinth Thermal Insulation Profiles EPS are demoulded, at which point they undergo a final quality control.



2.7 Environment and health during manufacturing

blaugelb Plinth Thermal Insulation Profiles EPS are Cradle to Cradle Certified® (C2C) at the Silver level. During the certification process, the modules material health, material cycle, renewable energy, water management and social responsibility are considered and in each case a material and process assessment is created (for details on the certificate, see *EPEA GmbH*).

2.8 Product processing/installation

Installation of the blaugelb Plinth Thermal Insulation Profiles EPS includes the following steps:

- Cutting to size
- Sealing
- Screwing together

It is screwed using the blaugelb Frame Screw Fix FK-T30. The vertical localised application of force in the anchor base is achieved using the blaugelb Spacer Block.

The horizontal forces are absorbed with the blaugelb Assembly Bracket and the quadruple screw connection in the blaugelb Plinth Thermal Insulation Profile EPS and with the double screw connection to the anchor base with the blaugelb Frame Screw Fix FK-T30. Horizontal load value tests have been performed in the complete ensemble.

The dovetail joint reduces the amount of waste while the 1175 mm – 1200 mm length of the individual profiles makes them easy to transport and store (Europallet).

2.9 Packaging

The blaugelb Plinth Thermal Insulation Profiles EPS are bundled with wrapping foil and packaged in plastic foil to protect them against solar radiation. They are delivered on conventional Europallets with cardboard inserts.

2.10 Condition of use

Raw material granulate is used to manufacture blaugelb Plinth Thermal Insulation Profiles EPS out of high-density EPS (expanded polystyrene). Most of the propellant pentane that is required for the foam structure escapes during the manufacturing process.

Emission during the storage and utilisation phase depends on various parameters such as the foam structure, the ambient temperature, the open surface and the air exchange when installed.

All substances used are resistant to ageing and moisture when installed, meaning that the insulating effect and the mechanical properties remain unchanged during the entire service life.

It is dimensionally stable and checked in accordance with *GEV EMICODE* EC1 Plus.

The blaugelb Plinth Thermal Insulation Profiles EPS have high ductility, compressive strength and flexural strength for load absorption.

2.11 Environment and health during use

EPS (expanded polystyrene) products have been used for over 50 years. There is no evidence of negative effects on humans, animals or the environment.

2.12 Reference service life

The service life specifications describe the time period assumed within the prognosis scenario after which a component installed today would likely be replaced. The specifications are based both on literature references as well as the experience of experts. In addition to the technical and functional aspects, replacements due to legal requirements as well as aspects for aesthetic reasons were also taken into consideration in the specifications.

The service life for blaugelb Plinth Thermal Insulation Profiles EPS based on high-density EPS (expanded polystyrene) is over 50 years.

The listed service lives are taken from the *BBSR* table "Service life of components for life cycle analysis according to the Assessment System for Sustainable Building (BNB)" from the Federal Institute for Research on Building, Urban Affairs and Spatial Development (*BBSR*) in the German Federal Office for Building and Regional Planning.

2.13 Extraordinary effects

Fire

DIN 4102-1: Building material class B2, normal combustibility, no flaming droplets.

Fire protection

Name	Value
Building material class acc. to DIN 4102-1	B2 – normal combustibility
Flaming droplets	No flaming droplets
Smoke gas development Euroclass according to EN 13501-1	E

Water

High-density EPS (expanded polystyrene) is chemically neutral, not water-soluble and does not give off any water-soluble substances that could lead to contamination of the groundwater, rivers and seas.

Thanks to their closed cell structure, blaugelb Plinth Thermal Insulation Profiles EPS made of high-density EPS generally retain the existing profile structure even with substantial moisture content. The insulating effect is retained.

Mechanical destruction

Data on the behaviour of the product, including possible consequences for the environment, in the event of unexpected mechanical destruction are not relevant.

2.14 Re-use phase

Recycling of rigid EPS foam from production waste has functioned for many years and has proven itself very well. Production residues resulting from block trimming, cutting to size or edge profiles are reused in the production plants.

After use, EPS insulating material can undergo material recycling or be thermally recycled.

2.15 Disposal

The products do not contain harmful substances that could limit their recyclability.

Plinth Thermal Insulation Profiles EPS that cannot be provided for the re-use phase under 2.14 contain great energetic potential that can be used in energetic recovery. The energy of 1 kg of EPS corresponds to that of approx. 1.1 litre of heating oil.

Additionally, the waste heat that is generated during recovery in a conventional waste-to-energy plant can be used both for electricity generation and for district heating generation. Where possible, the manufacturers recommend recycling of materials or at least an energetic recovery as a disposal procedure.

Waste code according to the European waste catalogue (Waste Catalogue Ordinance (*AVV*)): 17 06 04 – Insulation material except for those that fall under 17 06 01 and 17 06 03.

The blaugelb Plinth Thermal Insulation Profiles EPS are 100 % recyclable and are to be disposed of in accordance with the waste code 17 06 04 and 17 09 04.

2.16 Further information at www.meesenburg.de

3. LCA: Calculation rules

3.1 Declared unit

This Environmental Product Declaration applies to the declared unit of 1 m³ blaugelb Plinth Thermal Insulation Profile EPS, with a bulk density of 150 kg/m³.

Declared unit

Name	Value	Unit
Declared unit	1	m³
Bulk density	150	kg/m³

The declared unit contains the saleable end product. blaugelb Plinth Thermal Insulation Profiles EPS are produced in various dimensions. The data collection refers to an annual average and is representative for 100 % of the created products. Due to the homogeneous structure of the products, the environmental impact of the products correlates directly with their mass.

The fastenings of the blaugelb products are not part of the examination.

3.2 System boundary

The life cycle assessment of the blaugelb insulation products includes a cradle-to-gate examination with the modules C1-C3 and module D (A1–A3, +C, +D). The following life cycle phases are included in the analysis:

Module A1–A3 | Product phase
The product phase includes the costs of manufacturing the used base materials (EPS, pentane, etc.), as well as the associated transport of the raw materials.
Within the factory borders, the process steps pre-foaming, interim storage, foaming, block interim storage and processing of the insulation products are considered. The thermal energy is provided at the site using natural gas, while electrical energy is drawn from the photovoltaic system on the roof of the production halls as well as from the regional power grid. Production of the packaging used for delivering the products is also included in module A1–A3.

Module C1 | Deconstruction/demolition
Manual removal of the insulation products was assumed. The associated costs are negligible, meaning that no environmental impacts from the deconstruction of the products are declared.

Module C2/1 | Transport for material recycling
Module C2 contains the transport for waste treatment. For scenario 1, the transport via lorry over a transport distance of 100 km is estimated.

Module C2/2 | Transport for energy recovery
In scenario 2 for the energetic recovery of the products, the transport via lorry over a transport distance of 50 km is estimated.

Module C3/1 | Waste treatment with material recycling
In scenario 1, module C3 includes the shredding of the insulation products as the starting material for subsequent material recycling. The product flow that reaches module D for recycling leaves the product system in C3.

Module C3/2 | Waste treatment with energy recovery
Scenario 2 stipulates an energetic recovery of 100 % of the insulation products following removal from the building.

It is assumed that at their end of life, the insulation products are treated in a waste incineration plant to generate energy. The emissions from the incineration are declared in module C3 in this case. Based on information from Sphera (see *GaBi*), an R1 value of the waste incineration plant of > 0.6 is assumed.

Module C4/1 | Disposal with material recycling
The estimated scenario 1 declares the material recycling of the insulation products, meaning that no environmental impacts are to be expected from the disposal of the products in C4.

Module C4/2 | Disposal with energy recovery
The environmental loads from the energetic recovery (scenario 2) of the declared products are declared in module C3.
There are thus no costs to be declared in module C4.

Module D/1 | Benefits and loads beyond the system boundary with material recycling
In module D/1 a 100 % recycling scenario is declared, taking into consideration the potential for substitution of fossil polystyrene primary material.

Module D/2 | Benefits and loads beyond the system boundaries with energy recovery
In scenario 2, in module D the potential for substitution for heat and power from the energetic recovery of the product in module C3 is described in the form of a European average scenario.

3.3 Estimates and assumptions

If a representative background data set for depicting the environmental impact of certain raw materials is missing, estimates and assumptions are used. All assumptions are substantiated with detailed documentation and correspond to the best possible depiction of reality in view of the available data base.

3.4 Cut-off criteria

All relevant inputs and outputs for which data are available are contained in the life cycle assessment model. With an available data base, data gaps are filled with conservative assumptions from average data or generic data and are documented accordingly. Only data with share of less than 1 % was cut. Neglect of this data is justified by the insignificance of the expected impact. As a result, no processes, materials or emissions were neglected which are recognised to make a significant contribution to the environmental impact of the examined products.

The total of the neglected input flows does not exceed 5 % of the energy usage and mass.

3.5 Background data

To calculate the life cycle assessment, the *GaBi* 2022.2 background database with *GaBi* software version 10 was used.

3.6 Data quality

The collection of data is performed using data collection sheets adapted specifically to the industry. Questions are clarified in an iterative process in writing via e-mail, by phone or in online coordination discussions. Through the intensive discussion between the life cycle assessors Daxner & Merl and Meesenburg Großhandel KG on the most realistic possible depiction of material and energy flows between the production sites, it can be assumed that the foreground data collected is of high quality.

A consistent and uniform calculation method in line with *ISO 14044* was applied. When selecting the background data, attention is paid to the technological, geographical and time-related representativeness of the data basis. If specific data is missing, generic data sets or a representative average are used. The *GaBi* background data sets used are not older than ten years.

3.7 Period under review

During the collection of the foreground data, the inventory analysis for the declared products for production year 2021 was performed. All data refer to the used and produced annual quantities.

3.8 Geographical representativeness

Country or region in which the declared product system is manufactured and used, where applicable, as well as treated at its end of life: 27 EU member states.

3.9 Allocation

No by-products are created during production, which means that no co-product allocation was applied.

The costs for shredding the removed products in the end of life are considered part of the system boundary and declared in module C3. Environmental potential from the recycling of the products is taken into account after reaching the end-of-waste status in module D.

3.10 Comparability

Generally a comparison or the assessment of EPD data is only possible if all data sets to be compared were created in accordance with *EN 15804* and the building context or the product-specific performance characteristics are taken into account.

To calculate the life cycle assessment, the *GaBi* background database version 2022.2 with *GaBi* software version 10 was used.

4. LCA: Scenarios and additional technical information

Characteristic product features of biogenic carbon

The declared product does not contain biogenic carbon.

Information for a description of the biogenic carbon content at the factory gate

Name	Value	Unit
Biogenic carbon in the product	-	kg C
Biogenic carbon in the associated packaging	0.64	kg C

The carbon stored in the packaging was taken into account as "CO_2 neutral". This means that the storage effect through the carbon bound in the packaging is not included in the calculation and is considered theoretically immediately emitted.

Installation into the building (A5)

The end of life of the packaging materials is not declared in module A5.

Name	Value	Unit
Packaging (foil)	0.3	kg
Packaging (wood)	1.2	kg
Packaging (cardboard)	0.3	kg

End of life (C1–C4)

For the end of life of the products, a recycling scenario after the removal is assumed to be the probable scenario.

Name	Value	Unit
Collected separately (EPS)	150	kg
To recycling (C3/1)	150	kg
To energy recovery (C3/2)	150	kg

Re-use, recovery and recycling potential (D), relevant scenario information

Name	Value	Unit
Net flow (D/1, material recycling)	154	kg/m³

End-of-life scenario 1:
This scenario includes a recycling rate of 100 %.
blaugelb products do not contain any hazardous substances that could affect the recyclability. They can be shredded with a suitable device and then processed for future use. The technical feasibility of the recycling is thus guaranteed. Because these are new products that were developed for the longest possible utilisation in a building, no products have been deconstructed yet. Material recycling is thus considered the more realistic application.

The end-of-life scenario is to be adapted in the respective application context, where necessary.

The potentials resulting from recycling of the products are taken into account in module D. It is assumed that the processed material can replace the creation of primary PS. To quantify the potential for substitution at the product's end of life and for the production remnants for external recycling, the net material flow into module D was taken into account ("net flow calculation").

End-of-life scenario 2:
Through the energetic recovery of the insulation products in a waste incineration plant, thermal and electrical energy are generated. Potentials resulting from this are taken into account in module D through the substitution of thermal energy from natural gas and the average European electricity mix. This means that it is assumed that the thermal energy generated through the energetic recovery of the product can replace that generated from natural gas, and that the generated electrical energy can replace that generated from the regional electricity mix.

5. LCA: Results

The following table contains the life cycle assessment results for a declared unit of 1 m³ blaugelb Plinth Thermal Insulation Profile EPS (150 kg/m³).

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Re-use, recovery, recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA – ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ blaugelb Plinth Thermal Insulation Profile EPS (150 kg/m³)

Indicator	Unit	A1-A3	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
GWP-total	kg CO_2 eq.	6.02E+02	0	9.09E-01	4.54E-01	1.12E+01	5.06E+02	0	-3.54E+02	-2.02E+02
GWP-fossil	kg CO_2 eq.	5.94E+02	0	9.03E-01	4.51E-01	1.11E+01	5.06E+02	0	-3.52E+02	-2.01E+02
GWP-biogenic	kg CO_2 eq.	8E+00	0	0	0	9.96E-02	1.51E-02	0	-1.76E+00	-1.03E+00
GWP-luluc	kg CO_2 eq.	8.51E-02	0	6.07E-03	3.03E-03	2.34E-03	4.92E-04	0	-3.39E-02	-2.22E-02
ODP	kg CFC11 eq.	5.05E-09	0	8.84E-14	4.42E-14	1.62E-10	2.01E-11	0	-4.66E-10	-1.37E-09
AP	mol H+ eq.	8.53E-01	0	3.01E-03	1.5E-03	2.43E-02	4.43E-02	0	-4.95E-01	-2.65E-01
EP-freshwater	kg P eq.	8.92E-03	0	3.22E-06	1.61E-06	3.23E-05	4.68E-06	0	-4.25E-04	-2.78E-04
EP-marine	kg N eq.	2.77E-01	0	1.38E-03	6.88E-04	5.45E-03	9.65E-03	0	-1.35E-01	-7.19E-02
EP-terrestrial	mol N eq.	2.68E+00	0	1.54E-02	7.71E-03	5.72E-02	2.08E-01	0	-1.46E+00	-7.7E-01
POCP	kg NMVOC eq.	5.53E+00	0	2.7E-03	1.35E-03	1.47E-02	2.85E-02	0	-5.14E-01	-2.01E-01
ADPE	kg Sb eq.	6.17E-05	0	9.08E-08	4.54E-08	3.01E-06	4.86E-07	0	-4.11E-05	-3.05E-05
ADPF	MJ	1.61E+04	0	1.18E+01	5.91E+00	2.01E+02	5.47E+01	0	-1.12E+04	-3.42E+03
WDP	m³ world eq. deprived	1.81E+01	0	1.01E-02	5.04E-03	2.52E+00	4.1E+01	0	-3.72E+01	-2.15E+01

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 (ADP-minerals&metals) for non-fossil resources; ADPF = Abiotic depletion potential (ADP-fossil) for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA – INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ blaugelb Plinth Thermal Insulation Profile EPS (150 kg/m³)

Indicator	Unit	A1-A3	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
PERE	MJ	5.09E+02	0	8.19E-01	4.1E-01	1.11E+02	1.29E+01	0	-2.61E+02	-9.44E+02
PERM	MJ	2.34E+01	0	0	0	0	0	0	0	0
PERT	MJ	5.33E+02	0	8.19E-01	4.1E-01	1.11E+02	1.29E+01	0	-2.61E+02	-9.44E+02
PENRE	MJ	9.32E+03	0	1.19E+01	5.93E+00	7.1E+03	6.95E+03	0	-1.12E+04	-3.42E+03
PENRM	MJ	6.91E+03	0	0	0	-6.9E+03	-6.9E+03	0	0	0
PENRT	MJ	1.62E+04	0	1.19E+01	5.93E+00	2.01E+02	5.47E+01	0	-1.12E+04	-3.42E+03
SM	kg	2.42E-01	0	0	0	0	0	0	1.54E+02	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	1.49E+00	0	9.46E-04	4.73E-04	1.06E-01	9.61E-01	0	-1.74E+00	-9.08E-01

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 m³ blaugelb Plinth Thermal Insulation Profile EPS (150 kg/m³)

Indicator	Unit	A1-A3	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
HWD	kg	2E-06	0	6.28E-11	3.14E-11	1.74E-08	5.15E-09	0	-7.29E-07	-4.63E-07
NHWD	kg	1.24E+01	0	1.93E-03	9.67E-04	1.51E-01	1.83E+00	0	-2.64E+00	-1.73E+00
RWD	kg	7.33E-02	0	2.2E-05	1.1E-05	3.21E-02	3.31E-03	0	-4.16E-02	-2.71E-01

CRU	kg	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	1.5E+02	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	9.09E+02	0	0	0
EET	MJ	0	0	0	0	0	1.62E+03	0	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 m³ blaugelb Plinth Thermal Insulation Profile EPS (150 kg/m³)

Indicator	Unit	A1-A3	C1	C2/1	C2/2	C3/1	C3/2	C4	D/1	D/2
PM	Disease incidence	ND	ND	ND	ND	ND	ND	ND	ND	ND
IR	kBq U235 eq.	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-c	CTUh	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-nc	CTUh	ND	ND	ND	ND	ND	ND	ND	ND	ND
SQP	SQP	ND	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

The additional and optional impact categories according to *EN 15804*+A2 are not declared, as these indicators are to be classified as highly uncertain.

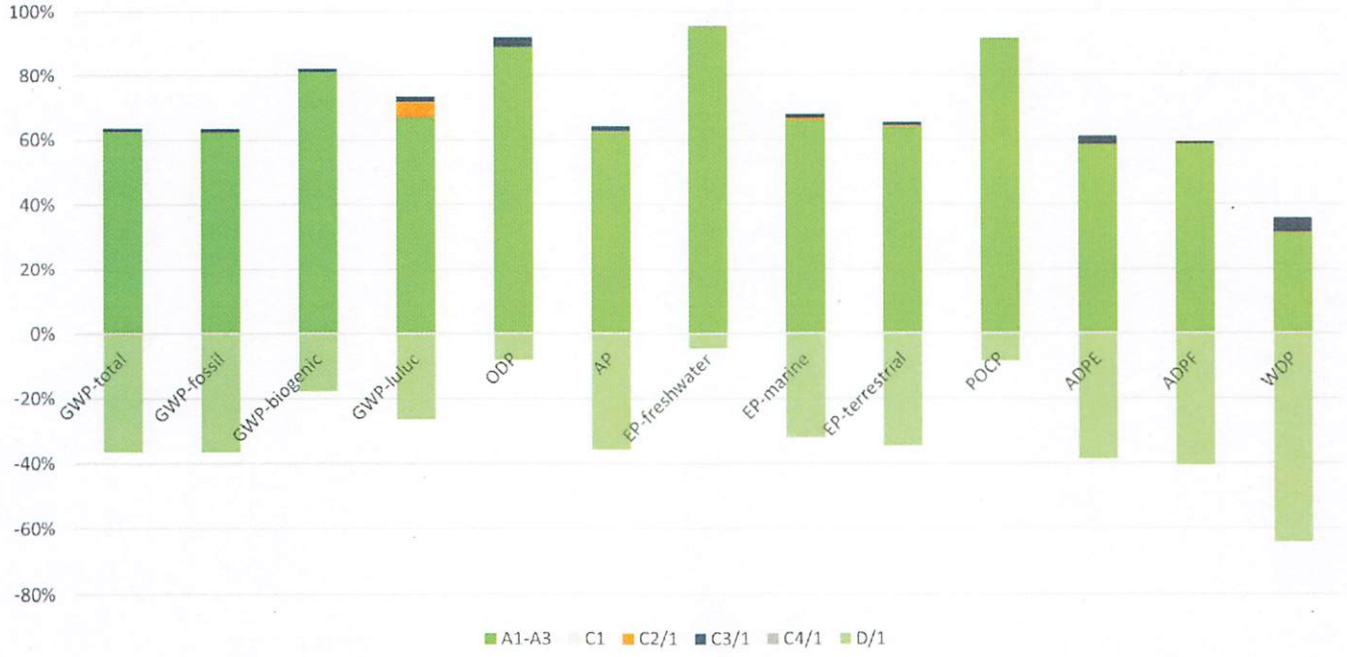
Limitation note 1 – applies for the indicator "Potential Human exposure efficiency relative to U235":
This impact category mainly deals with the potential impact of a low dose of ionising radiation on human health in the nuclear fuel cycle. It does not take into account impacts due to possible nuclear accidents and occupational exposure, nor does it consider the disposal of radioactive waste in underground facilities. The potential ionising radiation emitted by the ground, by radon and by certain building materials is also not measured by this indicator.

Limitation note 2 – applies for the indicators: "Abiotic depletion potential for non-fossil resources", "Abiotic depletion potential for fossil resources", "Water (user) deprivation potential", "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 must be used with care, as these results are highly uncertain or because there is only limited experience with the indicator.

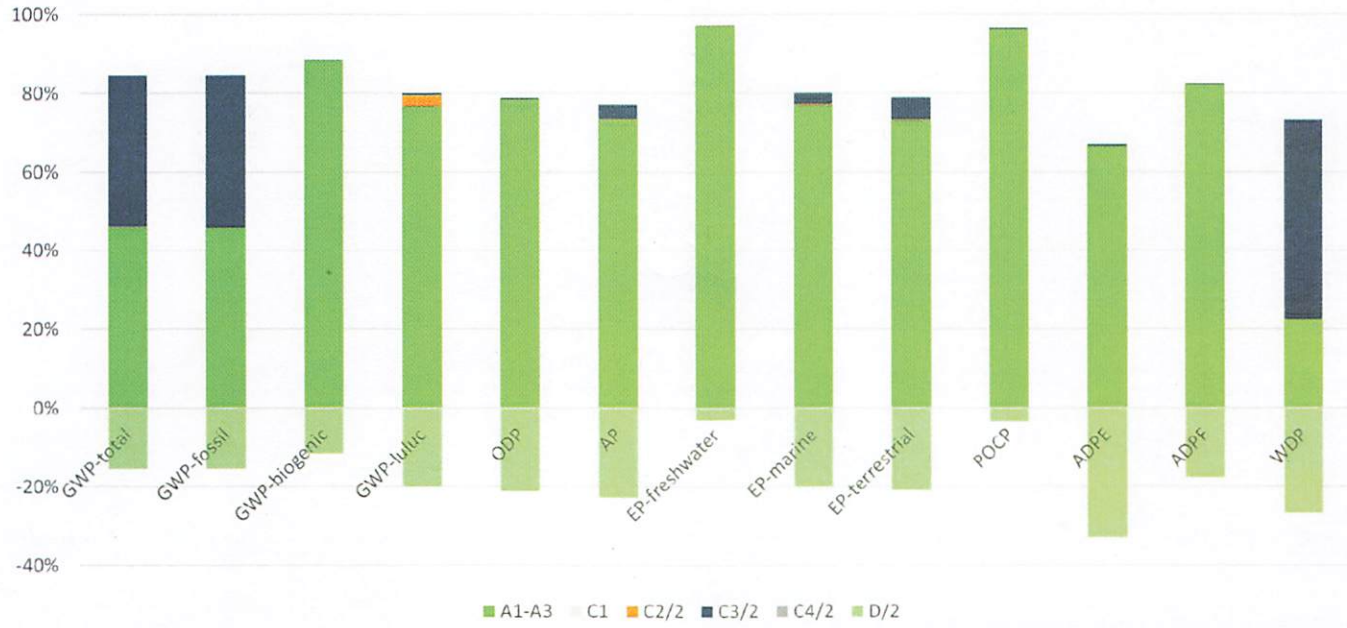
6. LCA: Interpretation

The following interpretation contains a summary of the life cycle assessment results with regard to a declared unit of 1 m³ blaugelb Plinth Thermal Insulation Profile EPS.

Relative contributions of the various life cycle phases of the blaugelb Plinth Thermal Insulation Profile EPS (100 % material recycling)



Relative contributions of the various life cycle phases of the blaugelb Plinth Thermal Insulation Profile EPS (100 % energy recovery)



If you compare the individual phases, a clear dominance of the **product phase** (modules A1–A3) is established for most indicators.
The environmental impacts of the product phase are primarily dominated by the supply chain of the purchased primary material. Exclusively with GWP-total, GWP-fossil and WDP in scenario 2, it can also be observed that the energetic recovery of the insulation products has a significant influence (module C3/2).

In scenario 1, thanks to the recyclability of the products the removed material at the **end of life** can be used to prevent the creation of fossil primary polystyrene, provided that the secondary EPS meets the quality requirements in the subsequent product system. The module D/1 shows the recycling potentials of fossil polystyrene at the products' end of life. Because no secondary EPS is used as input material in the production of the polystyrene, this results in a very high net flow into module D/1. This leads to high potentials from the substitution of primary PS ("credits").

The environmental impacts from the **transport for recycling** (module C2/1) and the **shredding** of the insulation products as the starting material for subsequent material recycling (C3/1) account for a small share of the environmental impact of the product.
In scenario 2, the GWP-total, GWP-fossil and WDP are impacted by the direct emissions of the **incineration plant** as well as the use of water to generate steam. Module D/2 shows the substitution potentials from energy recovery.
Use of the energy stored in the insulation products can avoid emissions from using (primarily) fossil energy sources.

The **transport for thermal recovery** (module C2/2) accounts for a small share of the environmental impact of the product.

In summary, the upstream environmental impacts from the production of the material component as well as the use of natural gas with the resulting direct emissions can be identified as the major factors of the environmental profile for the blaugelb products.

Due to the homogeneous structure of the products, the environmental impact of the products correlates directly with their mass.

7. Requisite evidence

blaugelb Plinth Thermal Insulation Profiles EPS are Cradle to Cradle Certified® (C2C) at the Silver level. During the certification process, the modules material health, material cycle, renewable energy, water management and social responsibility are considered.

Test institute: *EPEA GmbH* – Part of Drees & Sommer
Certificate number: 5801
Publication date: 3 November 2022
Expiry date: 30 June 2024

7.1 VOC emissions

Like all EPS products, insulation panels made of the raw material Neopor® Plus can be used for indoor applications. These are generally not directly exposed to the room air, however, but instead are covered by a surface coat.
As part of a European study, emissions from EPS insulation panels were measured based on 12 different types of EPS raw materials.

The measurements in accordance with *CEN TS 16516* and *ISO 16000-3, -6, -9* and *-11* were performed by Eurofins in April 2016. The tested insulating materials meet the requirements of the AgBB scheme for the use of building products in indoor applications. According to the French VOC regulation, the tested insulating materials are rated A+.

Name	Value	Unit
AgBB result overview (28 days)	25	µg/m³
TVOC (C6 – C16) (3 days)	72	µg/m³
R (dimensionless)	0.084	-
Carcinogens	1	µg/m³

7.2 Leaching

The leaching behaviour is not relevant for insulation panels made of the raw material Neopor® Plus.

8. References

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ISO 16000-3
ISO 16000-3:2022-09, Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds in indoor and test chamber air – Active sampling method.

ISO 16000-6
ISO 16000-6:2021-08, Indoor air – Part 6: Determination of organic compounds (VVOC, VOC, SVOC) in indoor and test chamber air by active sampling on sorbent tubes, thermal desorption and gas chromatography using MS or MS FID.

ISO 16000-9
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ISO 16000-11
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Further literature

AgBB
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AVV
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