

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A1

Owner of the Declaration	Xella Baustoffe GmbH
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-XEL-20180168-IBD1-EN
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Multipor Minerale Dämmplatte
Xella Baustoffe GmbH




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multipor[®]



1. General Information

<p>Xella Baustoffe GmbH</p> <p>Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <p>Declaration number EPD-XEL-20180168-IBD1-EN</p> <p>This declaration is based on the product category rules: Aerated Concrete, 07.2014 (PCR checked and approved by the SVR)</p> <p>Issue date 11/03/2019</p> <p>Valid to 10/03/2024</p> <p></p> <p>Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)</p> <p></p> <p>Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.)</p>	<p>Multipor mineral insulation board</p> <p>Owner of the declaration Xella Baustoffe GmbH Düsseldorfer Landstraße 395 D-47259 Duisburg</p> <p>Declared product / declared unit 1 m³ Multipor mineral insulation board with a bulk density of 115 kg/m³.</p> <p>Scope: The life cycle assessment is based on the Multipor manufacturing plants in Stulln and Cologne-Porz, Germany, and the 2013 database.</p> <p>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.</p> <p>The EPD was created according to the specifications of <i>EN 15804+A1</i>. In the following, the standard will be simplified as <i>EN 15804</i>.</p> <p>Verification</p> <p>The standard <i>EN 15804</i> serves as the core PCR</p> <p>Independent verification of the declaration and data according to <i>ISO 14025:2010</i></p> <p><input type="checkbox"/> internally <input checked="" type="checkbox"/> externally</p> <p></p> <p>Patricia Wolf (Independent verifier appointed by SVR)</p>
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2. Product

2.1 Product description/Product definition

The Multipor mineral insulation boards mentioned are thermal insulation boards made of calcium silicate hydrates with a very high percentage of air-filled pores.

For product placement in the EU/EFTA (with the exception of Switzerland), the Regulation (EU) No. /305/2011/ (CPR) is applicable. The product requires a declaration of performance according to the /ETA-05/0093/ of 07/06/2018, Multipor Mineral Insulation Board and the CE marking.

The use of the product is governed by the respective national regulations.

2.2 Application

Old and new buildings

- Interior and exterior insulation of outside walls
- Below-ceiling insulation of underground garages, cellars, passages
- Rooftop insulation of pitched and flat roofs, and of parking decks carrying loads
- As system component in the thermal insulation composite system (ETICS)
- Double-wall masonry
- Wall cavity insulation
- Ventilated curtain facades
- Floor insulation

2.3 Technical Data

Structural data

Name	Value	Unit
Compressive strength (mean value)	0.35	N/mm ²
Gross density	80 - 135	kg/m ³
Tensile strength (mean value)	0.08	N/mm ²
Thermal conductivity	0.042 - 0.05	W/(mK)
Water vapour diffusion resistance factor according to DIN 4108-4	3	-
Moisture content at 23 °C, 80%	6	M.-%
Bending strength (longitudinal)	-	N/mm ²
Shrinkage acc. to ZA-PBP-07-01, modified EN 680; adherence to a shrinkage value .of < 0.2 mm/m should be guaranteed.	-	mm/m

Performance values of the product pursuant to the performance declaration with reference to its essential characteristics according to ETA-05/0093/, 07/06/2018, Multipor mineral insulation board.

2.4 Delivery status

600 mm • 390 mm • d
 d = 20 / 30 / 40 / 50 / 60 / 80 / 100 / 120 / 140 / 160 /
 180 / 200 / 220 / 240 / 260 / 280 / 300 mm

2.5 Base materials/Ancillary materials

Basic materials

Name	Value	Unit
Sand	25-40	M-%
Cement	25-50	M-%
Quicklime	5-25	M-%
Anhydrite/gypsum	3-7	M-%
Mineral aggregate	10-20	M-%
Aluminium as pore forming substance	0,7-0,8	M-%

In addition, 75 - 140 M-% water (relative to solid material) is used.
 Formwork oil serves as auxiliary material.

Sand: The sand used is a natural raw material containing the principal mineral, quartz (SiO₂), as well as secondary and trace minerals. It is an essential raw material for the hydrothermal reaction during steam curing.

Cement: Cement according to /DIN EN 197-1/ serves as a binder and is made primarily of limestone marl or a mixture of limestone and clay. The natural raw materials are burned and then ground.

Quicklime: Quicklime acc. to /DIN EN 459-1/ serves as a binder and is manufactured by burning natural limestone.

Anhydrite / gypsum: The sulphate carrier is used to influence the curing time of the raw mix, and is derived from natural deposits or is produced artificially.

Mineral supplement: Insulation board aggregate is produced from crushed insulation board itself / aerated concrete aggregate is obtained from crushed aerated concrete and /or ground limestone as an additional mineral component.

Aluminium: Aluminium paste is used as the pore-forming agent. The metallic aluminium reacts in an alkaline environment whereby hydrogen gas is released, which forms the pores and escapes into the atmosphere at the end of the foaming process.

Water: The presence of water is fundamental for the hydraulic reaction of the binding agents. In addition, water is required to produce a homogeneous suspension.

Formwork oil: Formwork oil is used as separating agent to separate the Mulltipor board compound from the mould. Mineral oils free of polycyclic aromatic hydrocarbons are used and contain long-chain additives to increase viscosity. This prevents run-off in the mould, thus enabling economical use.

Water-repellent agent: The compound formula contains water-repellent agent in very small quantities. This reduces the water absorption of the mineral insulation board. □ Liquid silicones are used (silicon atoms chain-linked by oxygen atoms) for this purpose. The product contains SVHC according to /Candidate List (05/02/2019) of ECHA/ in excess of 0.1 wt%: no
 The product contains further CMR substances of category 1A or 1B not included on the Candidate List, in excess of 0.1 wt%: no

Biocidal products have been added to the present building product or it has been treated with biocidal

products (it is thus a treated product within the meaning of /Biocidal Products Regulation (EU)/ No. 528/2012): no

2.6 Manufacture

The ground silica sand is mixed with the other raw materials in a mixer in the presence of water and aluminium paste, to form a raw mix which is poured into casting moulds. The water slakes the lime, simultaneously releasing heat.

The aluminium reacts in the alkaline environment. This process releases hydrogen gas, which produces the pores in the mass and escapes to the atmosphere leaving no residue. The pores normally have a diameter of 0.5 – 1.5 mm and are filled with air. After initial setting, semi-solid raw blocks are produced, which are cut mechanically with high-precision tools to produce the insulation boards.

The final properties of the components are established during the subsequent steam curing during 5 - 12 hours at about 190°C and pressure 12 bar in steam pressure boilers, the so-called autoclaves. Here, the raw materials combine to form calcium silicate hydrates, which correspond to the naturally occurring mineral tobermorite. The reaction of the material is complete once it is removed from the autoclave. The steam is utilised for further autoclave cycles, after completion of the curing process. The accumulated condensate is recycled as process water. Thus energy is saved and no waste water is produced.

2.7 Environment and health during manufacturing

The general statutory regulations and the rules and regulations of the employers' liability insurance associations are applicable. No special measures must be taken to protect the environment or the health of employees.

2.8 Product processing/Installation

The processing of Mulltipor mineral insulation boards is carried out by hand. The insulation boards are cut with band saws or by hand using carbide saws, as these produce practically only coarse particles and no fine dust. High-speed tools such as angle grinders are not suitable for processing Mulltipor due to the release of fine dust.

Mulltipor mineral insulation boards are attached to the processing surface with a specially adapted light mineral mortar (average 3.5 kg/m²). Anchors can also be used. To complete the interior finish of the Mulltipor mineral insulation boards, they can be plastered, painted or lined with building panels.

2.9 Packaging

Mulltipor mineral insulation boards are packaged in recyclable polyethylene (PE) shrink film, stacked on Euro pallets and shrink-wrapped in recyclable polyethylene (PE) shrink foil. Non-soiled PE foil is taken back by the Xella plants and forwarded to the foil manufacturers for recycling.

2.10 Condition of use

Mulltipor mineral insulation boards are not subject to any further change once the autoclave process is complete.

2.11 Environment and health during use

To the best of our knowledge, Mulltipor mineral

insulation boards do not emit any harmful substances such as VOC.

The natural ionizing radiation of Multipor mineral insulation boards is extremely low, so there are no radiological restrictions to the use of this building material.

2.12 Reference service life

Under normal conditions of use, the service life of Multipor insulation boards is ≥ 50 years with reference to the /BBSR table/ "Service life of components for life cycle analysis according to BNB".

2.13 Extraordinary effects

Fire

In case of fire, no toxic gases and vapours can be generated. Multipor mineral insulation boards meet the requirements of building material class A1, "non-combustible" according to /DIN EN 13501-1/.

Fire safety

Name	Value
Building material class	A1
Burning droplets	d0
Smoke gas development	s1

Water

Multipor mineral insulation boards show a weak alkaline reaction (pH value approx. 10) when exposed to water (e.g. flooding). No substances that could pose a water hazard are leached out.

Mechanical destruction

Unforeseen mechanical destruction poses no known risks to the environment or to living organisms.

2.14 Re-use phase

Multipor mineral insulation boards can survive the service life of the buildings they insulate. At the present time, there appears to be very little possibility of reusing or further using the insulation boards after dismantling. Due to the newness of the product there is no practical experience to draw on.

2.15 Disposal

Multipor mineral insulation boards can be disposed of in Class II landfill sites in accordance with /DepV/ [Landfill Directive].

Key according to /European waste catalogue/ (EWC): 17 01 01. 17 01 01.

2.16 Further information

For further information please refer to the homepage www.multipor.com.

3. LCA: Calculation rules

3.1 Declared Unit

The declaration refers to the production of 1 m³ Multipor mineral insulation board with an average density of 115 kg/m³. This material is non-reinforced aerated concrete with low bulk density. Xella Baustoffe GmbH produces Multipor at two locations in Germany. An average was calculated on the basis of the annual production volume in 2013.

Declared unit

Name	Value	Unit
Declared unit	1	m ³
Gross density	115	kg/m ³
Conversion factor to 1 kg	1/115	-

3.2 System boundary

Type of EPD: Cradle to factory gate

In detail, the following processes were included in the product stage A1-A3 of the production of aerated concrete products:

- Provision processes for auxiliary materials & energy
- Transport of resources and raw materials (cement, lime, sand, etc.) to the respective production site
- Manufacturing process in the plant including energy consumption, production of auxiliary materials, disposal of residual materials
- Production of the proportional packaging

In the EPD, the CO₂ stored in the packaging material (wooden pallet) by photosynthesis is taken into account within A1-A3 and re-emitted in A5 as biogenic CO₂ emissions. Thus, the CO₂ neutrality of renewable

raw materials within the system boundaries is ensured.

Modules A5 and D only show the debits and credits for packaging disposal. Therefore, the modules A5 and D are not completely declared.

3.3 Estimates and assumptions

In the context of the life cycle assessment, no approximations or assessments are necessary.

3.4 Cut-off criteria

All data from the collection of operating data, i.e. all raw materials used according to the compound formula, the thermal energy used, the internal fuel consumption and the electricity consumption, all direct production waste as well as all available emission measurements were taken into account in the LCA. Where no primary data was available, assumptions were made about transport expenditure for all inputs and outputs taken into account. Material and energy flows with a share of less than 1% were also taken into account. It can be assumed that the sum of neglected processes does not exceed 5 % of the impact categories. The machines, equipment and infrastructure required for production were neglected.

3.5 Background data

The software system for Holistic Balancing /GaBi6/ Servicepack 36, developed by thinkstep AG was used to model the production of insulation boards. The consistent data sets contained in the GaBi database are documented in the online /GaBi-Dokumentation/. The basic data of the GaBi database was used for energy, transport and auxiliary materials. The life cycle assessment was compiled for the reference area Germany. As a result, in addition to the production processes under these boundary conditions, the preliminary stages relevant for Germany, such as the provision of electricity or energy sources, were also

used. The electricity mix for Germany with reference year 2014 was applied.

3.6 Data quality

All background data sets relevant for the production were taken from the database of the software /GaBi6/. Foreground data was provided by Xella Baustoffe GmbH.

The last revision of the background data used took place less than 1 year ago. The production data comprises current industry data from Xella Baustoffe GmbH dating from 2013.

Overall, the quality of the data and also the robustness of the results in terms of averaging can be classified as good.

3.7 Period under review

Data records on the production of insulation board products from 2013 form the data basis of this Life Cycle Assessment. The consumed quantities of raw materials, energy and auxiliary and operating materials are factored in as 12-month averages in the plants.

3.8 Allocation

One of the two manufacturing plants is a combination plant producing Ytong as well as Multipor. In this case the production figures were allocated by Xella Baustoffe GmbH. There was no need for Thinkstep AG to carry out any allocation, as all production data provided refers exclusively to the manufacture of Multipor insulation boards.

Furthermore, aerated concrete fractures occur in the production process, which are immediately reused in production as crushed aerated concrete recycling material. These flows are modelled as a closed loop. Any energy costs for the crushing process are already included in the plant data.

3.9 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 used background database has to be mentioned.

4. LCA: Scenarios and additional technical information

Installation in building (A5)

No costs for installing the product were included, but merely the costs for disposal of the packaging materials. The latter refer to replacement of Euro pallets and disposal of used PE foil.

Credits (D)

Module D contains the energy gains yielded by the combustion processes from A5 (packaging waste). A waste incineration plant with an R1 value > 0.6 was assumed.

Installation in building (A5)

Name	Value	Unit
Packaging total	17,85	kg

5. LCA: Results

The following is a representation of the environmental impacts for 1m³ Multipor mineral insulation board manufactured by Xella Baustoffe GmbH. The modules marked "x" in the overview according to /EN 15804/ are addressed here. Modules marked "MND" (module not declared) are not taken into consideration. The following tables show the results of the indicators of impact assessment, resource use, waste and other output flows in relation to the declared unit.

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

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 m³ Multipor

Parameter	Unit	A1-A3	A5	D
Global warming potential	[kg CO ₂ -Eq.]	9.84E+1	3.42E+1	-1.24E+1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.35E-11	6.44E-13	-2.72E-11
Acidification potential of land and water	[kg SO ₂ -Eq.]	1.48E-1	3.18E-3	-2.10E-2
Eutrophication potential	[kg (PO ₄) ³ -Eq.]	2.26E-2	6.63E-4	-2.27E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.31E-2	2.61E-4	-1.64E-3
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	8.58E-5	3.14E-7	-3.54E-6
Abiotic depletion potential for fossil resources	[MJ]	1.11E+3	5.56E+0	-1.71E+2

RESULTS OF THE LCA - RESOURCE USE according to EN 15804+A1: 1 m³ Multipor

Parameter	Unit	A1-A3	A5	D
Renewable primary energy as energy carrier	[MJ]	1.90E+2	2.38E+2	-4.22E+1
Renewable primary energy resources as material utilization	[MJ]	2.37E+2	-2.37E+2	0.00E+0
Total use of renewable primary energy resources	[MJ]	4.27E+2	1.07E+0	-4.22E+1
Non-renewable primary energy as energy carrier	[MJ]	1.16E+3	7.79E+1	-2.18E+2
Non-renewable primary energy as material utilization	[MJ]	7.12E+1	-7.12E+1	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	1.23E+3	6.69E+0	-2.18E+2
Use of secondary material	[kg]	0.00E+0	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m ³]	4.54E-1	8.15E-2	-5.76E-2

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES according to EN 15804+A1: 1 m³ Multipor

Parameter	Unit	A1-A3	A5	D
Hazardous waste disposed	[kg]	3.30E-6	4.16E-9	-8.88E-8
Non-hazardous waste disposed	[kg]	2.61E+1	7.24E-2	-9.37E-2
Radioactive waste disposed	[kg]	4.48E-2	4.45E-4	-1.86E-2
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	1.75E+1	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	5.31E+1	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	9.52E+1	0.00E+0

The impact assessment results only represent relative statements. They do not make any statements about endpoints of impact categories, overstepping of threshold values, safety margins or risks.

6. LCA: Interpretation

The environmental impacts of the production of Multipor aerated concrete are dominated by the consumption of energy (electricity, natural gas) in the plant and the environmental burdens in the upstream chain for the production of the binding agents

(quicklime, cement). In terms of global warming potential (GWP), about half of the burden is accounted for by the energy used and the other half by the raw materials cement and quicklime. Primary fossil-fuel consumption arises mainly (60 %) from energy use.

7. Requisite evidence

7.1 Radioactivity

Monitoring body: Verein für Kernverfahrenstechnik und Analytik Rossendorf e.V. (VKTA – Radiation Protection, Analytics & Disposal), Dresden

Method: Measurement of nuclide content in Bq/kg, determination of activity index I

Test report: /Measurement report 1813.10/, dated 29/10/2014

Result: The evaluation of the samples was carried out according to the /Directive of the European Commission "Radiation Protection 112"/ (Radiological Protection Principles concerning the Natural Radioactivity of Building Materials, 1999). The index values I determined are lower than the exclusion level in all cases, hence no further controls are required.

From a radiological point of view, the natural radioactivity of this building material allows its unrestricted use.

7.2 VOC Emissions

Monitoring body: eco-INSTITUT GmbH, Köln

Test report: Multipor mineral insulation board and Multipor light mortar, insulation board for use in interior, ceiling, roof and exterior insulation No.: 40173-001 vom 25/07/2013

Process: Tests in the 0.125 m³ chamber acc. to /DIN EN ISO 16000-9/

Result: The material complies with the conditions of emission class A+ when assessed in accordance with the VOC Regulation.

8. References

/IBU 2016/

IBU (2016): General EPD Program Guidelines of Institut Bauen und Umwelt e.V. (IBU). Version 1.1, Institut Bauen und Umwelt e.V., Berlin.

/ISO 14025/

DIN EN /ISO 14025:2011-10/, Environmental product declarations - Type III Environmental declarations - Principles and procedures.

/EN 15804/

/EN 15804:2012-04+A1 2013/, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

PCR 2013, Part B

Institut Bauen und Umwelt e.V., Berlin (ed.): Product category rules for construction products in the Program for Environmental Product Declarations of Institut Bauen und Umwelt (IBU) Part B: Requirements for the EPD on aerated concrete. v1.5 2013-10, www.bau-umwelt.de

Regulation (EU) No. 305/2011 of the European Parliament and the European Council of 9 March 2011, also EU Construction Products Regulation (CPR)

DIN EN 197-1: 2011-11; Cement - Part 1:

Composition, specifications and conformity criteria for common cements; German version EN 197-1:2011

DIN EN 459-1: 2015-07; Building lime - Part 1:

Definitions, specifications and conformity criteria; German version EN 459-1:2015

ETA-05/0093 Xella Deutschland GmbH – Mineral heat insulation board "Multipor Mineral insulation board", 07/06/2018

DIN EN 13501-1:2010-01 +A12009: Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests; German version EN 13501-1:2007+A1:2009

DepV (2009): DepV (2009): Ordinance on landfill and long-term disposal sites - Landfill ordinance of

27/04/2009 (BGBl I S. 900), last amended by Art. 7 V of 26/11/2010

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Protection 112": European Commission: Radiological Protection Principles concerning the Natural Radioactivity of Building Materials, 1999

GaBi 6: Software and database for holistic life cycle assessment. LBP, University Stuttgart and PE International, 2013.

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Measurement report 1813.10: Verein für Kernverfahrenstechnik und Analytik Rossendorf e.V. (VKTA – Radiation Protection, Analytics & Disposal), Dresden, 29/10/2014

Test report 40173-001: eco-INSTITUT GmbH, Cologne, 25/07/2013

DIN EN ISO 16000-9:2008-04; Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method (ISO 16000-9:2006); ECHA Candidate List Candidate List of Substances of Very High Concern for Authorisation (published in accordance with Article 59 (10) of the REACH Regulation) <http://echa.europa.eu/de/candidate-list-table>, status 02/05/2019

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