ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A1*

Owner of the Declaration	Armstrong World Industries Ltd
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-AWI-20200044-ICA1-EN
Issue date	08.01.2020
Valid to	07.01.2025

Bioguard Acoustic (17mm)

Armstrong World Industries Ltd

Institut Bauen und Umwelt e.V.

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

1. General Information

Armstrong World Industries Ltd	Bioguard Acoustic (17mm)
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** Armstrong World Industries Ltd Kingsway South Team Valley Trading Estate Gateshead Tyne & Wear NE11 OSP
Declaration number EPD-AWI-20200044-ICA1-EN	**Declared product / declared unit** Mineral ceiling tiles (wet felt) 17mm / 1m²
This declaration is based on the product category rules: Mineral panels, 12.2018 (PCR checked and approved by the SVR)	**Scope:** This declaration and its LCA study are based on 2016 production data for ceiling products manufactured at the Armstrong Munster plant in Germany.
Issue date 08.01.2020	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.
Valid to 07.01.2025	The EPD was created according to the specifications of *EN 15804+A1*. 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 14025:2010* ☐ internally ☒ externally
Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	
Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	Dipl. Natw. ETH Sascha Iqbal (Independent verifier appointed by SVR)

2. Product

2.1 Product description/Product definition

Mineral ceiling tiles and planks are factory produced using the wet felt process. They meet the requirements of /DIN 18177/ and are placed on the market in accordance with /EN 13964/ as well as German legislation on hazardous substances. Mineral tiles and planks consist of mineral wool(s), fillers and binders.

The Bioguard Acoustic (17mm) combines a cleanable surface and resistance to disinfectants as well as an antimicrobial performance and is available in a range of different edge details; Board, Tegular, and MicroLook.

For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) /Regulation (EU) No. 305/2011 (CPR)/ applies. The product needs a Declaration of Performance taking into consideration /EN 13964/ Suspended ceilings - Requirements and test methods and the CE marking.

2.2 Application

Wet felt mineral suspended ceiling products are used as aesthetic internal ceiling linings and offer concealment of building services as well as providing sound absorption, sound insulation, fire resistance and very low Volatile Organic Compound (VOC) emissions. Typical applications are in offices, schools, healthcare premises, retail, leisure and transport sectors.

2.3 Technical Data

Constructional data (acc. to /EN 13964/)

Name	Value	Unit
Thermal conductivity	0.06	W/(mK)
Sound absorption coefficient acc. to /EN ISO 354/ and /EN ISO 11654/	0.60	%
Flanking Transmission of Airborne Sound acc. to /EN ISO 10848-2/ & /EN ISO 717-1/	36	dB
Nominal density	224	kg/m³

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to /EN 13964/ (not part of CE-marking).

2.4 Delivery status

The EPD refers to 17mm thick tiles and planks that can have varying length and width dimensions.

2.5 Base materials/Ancillary materials

Name	Value	Unit
Binding Agent - mainly starch	0 - 10	%
Mineral Fibre	20 - 70	%
Cellulose Fibre	0 - 10	%
Clay	20 - 50	%
Perlite	10- 50	%
Other	< 1	%

Dispersion paint and mineral coatings are additionally used for the surface finish as well as water during the production process.

Contains substances on the /candidate list/ (date: 16.07.2019) exceeding 0.1 mass percentage in at least one partial product: **no**.

Contains other Carcinogenic Mutagenic Reprotoxic (CMR) substances in categories 1A or 1B which are not on the /candidate list/, exceeding 0.1 mass percentage in at least one partial product: **no**.

Flame retardants are not used. Thiadiazinanes ("Dazomet", an organosulfur compound) based products are used as biocides.

2.6 Manufacture

The described mineral products are produced using the wet felt process. The initial materials are mixed with water to a homogenous suspension that is then pumped onto a belt conveyor (Fourdrinier). The water is removed both mechanically (gravity and vacuum) and by evaporation in a drying oven. The process water is reused as much as possible. It is treated and re-fed into the process water circuit. Production waste and dust are reused in the production process. Armstrong World Industries is /ISO 9001/ certified.

2.7 Environment and health during manufacturing

Armstrong World Industries meet EU and Germany specific legal requirements for the production of mineral boards.

- It is prohibited to produce and use biopersistent fibres /Hazardous Substances Ordinance/ (Annex iv, nr 22)
- It is prohibited to bring bio-persistent fibres onto the market /Chemicals Prohibition Ordinance/ (Nr. 23 of the Annex to §1)
- Not subject to registration according to Article 7 or communication and notification according to Article 33 of the Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (/REACH/)
- Dust and formaldehyde air concentrations in critical working areas are below the upper value of occupational exposure limits. Exempted from measuring crystalline silica in the air by the competent authorities, as historical values measured were lower than 1/10 of the limit.

Armstrong World Industries is /ISO 14001/ certified.

No direct contact of workers with clay (except sample taking), as the clay is stored in a silo from where it automatically goes to a mixing tank after which the slurry is pumped to a holding tank.

2.8 Product processing/Installation

There are no recognized systemic hazards associated with installing ceiling panels. Armstrong Building Products recommends that installers handle materials in a manner to minimise airborne dust. Installers should wear appropriate personal protective equipment, such as gloves, safety glasses, and dust mask, to minimize exposure to dust and the potential for skin irritation.

2.9 Packaging

The products are packed in cardboard cartons and sealed with polyethene film. These cartons are then stacked on chemically untreated wooden pallets which are then wrapped with polyethene stretch film. Film, paper and wood can be recycled in the usual way.

2.10 Condition of use

When used properly, the mineral products maintain their mechanical and physical properties for their entire useful life.

2.11 Environment and health during use

When correctly installed no dust / particles will be released during the period of use. The limits for formaldehyde, VOC´s and Total Volatile Organic Compounds (TVOC)´s are in compliance with /DIN 18177/

2.12 Reference service life

The useful life of the mineral products is up to 50 years depending on application, loading and level of maintenance.

2.13 Extraordinary effects

Fire

The declared products have the building material class A2-s1,d0 according to /EN 13501-1/. They are therefore designated by German building regulations as "non-combustible" with negligible smoke development and no burning droplets in the case of fire.

Fire protection

Name	Value
Building material class	A2
Burning droplets	s1
Smoke gas development	d0

Water

Prolonged contact with water dissolves the binding starch which can lead to a loss of structure. Should the soluble components be carried into the sewage system they are biodegradable, increasing Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD).

Mechanical destruction

If not handled correctly the surface and edges may be broken or damaged.

2.14 Re-use phase

Correctly demounted tiles and planks can be reinstalled. Mineral tiles and planks can be returned to the production process for recycling into new mineral ceiling tiles when material separation and sufficient material quality is available. Refer to Armstrong's recycling programme described under www.armstrongceilings.com > "Corporate Social Responsibility" > "Sustainability" > "Circular Economy".

2.15 Disposal

The /European Waste Code/ for site waste is designated as 17 09 04 and end-of-life and off-cut ceiling products can be returned to Armstrong for recycling.

2.16 Further information

Additional information is available from the Armstrong websites www.armstrongceilings.com

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit for this EPD is 1m^2 of Sierra OP (15mm) ceiling panel for use over 50 years

Declared unit

Name	Value	Unit
Declared unit	1	m^2
Grammage	4.5	kg/m^2
Thickness of the panels	17	mm
Conversion factor to 1 kg	4.5	-

3.2 System boundary

The system boundaries studied as part of this cradle to grave LCA include the following information modules as per /EN15804/.

The Cradle to Grave Assessment Includes:

- A1: Raw materials production including substrate, coating, and packaging materials for ceiling panels
- A2: Transportation of raw materials to Armstrong manufacturing facility
- A3: Manufacturing of the ceiling panels at an Armstrong facility
- A3: Packaging of finished product including energy to operate packaging equipment
- A4: Transportation from manufacturing facility to distribution centres, retailers, job site (assumed to be 1200 km)
- A5: Installation into the building including 7% construction waste.
- B1-7: Use and maintenance (0 emissions as the ceiling tiles do not require maintenance during life)
- C1: Deconstruction (0 emissions as is done by manual labour)
- C2: Transportation to landfill (assumed to be 100 km)
- C3: Waste processing (0 emissions)
- C4: End of life includes disposal of ceiling panel (54.5% landfill, 44.5% incineration and 1% recycled)
- D: Benefits and loads beyond the system boundary

The Assessment Excludes:

- Steel suspension systems that are used for most installations
- Overhead energy usage (heating, the lighting of manufacturing facility)

3.3 Estimates and assumptions

There are no specific assumptions to list that are not dealt with in the appropriate section.

3.4 Cut-off criteria

All inputs to a unit process that contribute to more than 1% of the total mass or primary energy usage were included in the study.

It can be assumed that the total of neglected input flows per module contributed to less than 5% of energy usage and mass.

3.5 Background data

The primary data for the ceiling tile manufacturing process was provided for the Munster manufacturing facility for the year of 2016. The background data were

taken from the /Ecoinvent 3.3/ database and results were calculated with /SimaPro 9.0/ software.

3.6 Data quality

To model the life cycle of the production of mineral boards, data was used which was collected from the Munster Germany manufacturing plant for the 2016 production year. All other relevant data were taken from the /Ecoinvent 3.3/ database and is less than 10 years old.

3.7 Period under review

The data are representative of the manufacturing processes of 2016.

3.8 Allocation

Energy (electrical and thermal from natural gas) needed for the production at Armstrong has been allocated by dividing the full energy consumption in 2016 by the total amount of ceiling tiles produced in m^2.

Credits for electricity and heat gained from thermal recycling of waste and packaging in a solid waste incinerator and/or landfill were included in this study assuming an R1-value of below 60% (16% electrical efficiency; 36% thermal efficiency).

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.

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4. LCA: Scenarios and additional technical information

The following technical information is the basis for the declared modules or can be used for the development of specific scenarios in the context of building assessment.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel based on Ecoinvent "market for transport, freight, lorry, unspecified GLO"	39.71	l/100km
Transport distance	1200	km
Capacity utilisation (including empty runs)	50	%
Gross density of products transported	265	kg/m^3
Capacity utilisation volume factor	1	-

Installation into the building (A5)

There is no energy or water use required for the ceiling tile installation. For suspended ceilings, a 7% waste factor was assumed on-site during construction. This value is based on historic internal studies which have documented the quantity of scrap that is generated at the job site due to needed cuts (to allow for the installation of sprinkler heads, for example) or mistakes. While this material can be and is recycled from some jobs, it is assumed that all of the on-site scrap material will be sent off-site for disposal.

Name	Value	Unit
Auxiliary	0	kg
Water consumption	0	m^3
Other resources	0	kg
Electricity consumption	0	kWh
Other energy carriers	0	MJ
Material loss	0.315	kg
Output substances following waste treatment on site	0	kg
Dust in the air	Not assessed (*)	kg
VOC in the air	Not assessed (*)	kg

(*) Note, measures for safe handling and installation referred to in section 2.8 above.

Use or application of the installed product (B1-B7)

The use period for this product was considered as part of the study. The reference service life (RSL) was 50 years. During this time period, there is typically no repair or maintenance that is required over any particular time period. The ceiling tile can typically last for the entire life of the building and there is no recommended or generally accepted replacement or refurbishment cycle. Once the ceiling tiles are in place they do not require any energy or water usage. Therefore the environmental impact of a ceiling tile during the use phase is negligible. All tiles meet VOC test criteria as outlined in Section 7.

Reference service life

Name	Value	Unit
Reference service life	50	a

End of life (C1-C4)

C1 and C3 have been estimated to be zero. As a consequence, an impact of zero resulted for all results indicators assessed for these modules. For this study, 54,5% ceiling tiles that are not recycled are sent to landfill and 44,5% are incinerated. Despite that Armstrong has a recycling programme in place, the recycling rate of ceiling tiles at End of Life (EoL) is estimated at 1%. As a consequence of this very low

recycling rate, loads and benefits beyond the system boundary from recycling the product itself at EoL have been estimated to be zero (total results for module D however are not zero due to contributions from other phases, such as production).

Name	Value	Unit
Collected separately	0	kg
Collected as mixed construction waste	4.5	kg
Reuse	0	kg
Recycling	0.05	kg
Landfilling	2.5	kg
Energy recovery	0	kg
Distance to incinerator or landfill	100	km
R1 factor for Waste incineration	<60	%
Thermal treatment (EoL incineration)	2	kg

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

In module D reuse of the wooden pallet (98%), avoided electricity and heat production because of thermal treatment are accounted for, as well as the loss of stone wool and glass fibre (99% landfill or thermally treated) that entered the system as secondary materials.

5. LCA: Results

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	X	X	X	X	X	X	X	X	X	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 m² Bioguard Acoustic (17mm)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	5.16E+0	7.06E-1	4.16E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.53E-2	0.00E+0	1.14E-1	2.46E-1
ODP	[kg CFC11-Eq.]	6.01E-7	1.32E-7	4.38E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.22E-8	0.00E+0	1.10E-8	-9.02E-9
AP	[kg SO_2-Eq.]	1.43E-2	3.11E-3	1.06E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.88E-4	0.00E+0	3.18E-4	2.25E-3
EP	[kg $(PO_4)^{3-}$-Eq.]	4.05E-3	5.62E-4	2.97E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.20E-5	0.00E+0	6.31E-5	1.09E-5
POCP	[kg ethene-Eq.]	7.95E-4	1.26E-4	5.88E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.16E-5	0.00E+0	2.37E-5	1.14E-4
ADPE	[kg Sb-Eq.]	5.51E-6	1.99E-6	4.07E-7	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.84E-7	0.00E+0	8.72E-8	5.23E-7
ADPF	[MJ]	6.83E+1	1.07E+1	4.93E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.92E-1	0.00E+0	9.93E-1	1.26E+0

Caption	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

RESULTS OF THE LCA - RESOURCE USE according to EN 15804+A1: 1 m² Bioguard Acoustic (17mm)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	[MJ]	1.22E+1	1.50E-1	8.54E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.38E-2	0.00E+0	2.76E-2	-5.33E+0
PERM	[MJ]	6.13E+0	0.00E+0	4.29E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	1.83E+1	1.50E-1	1.28E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.38E-2	0.00E+0	2.76E-2	-5.33E+0
PENRE	[MJ]	8.29E+1	1.16E+1	5.96E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.07E+0	0.00E+0	1.08E+0	2.10E+0
PENRM	[MJ]	7.91E-2	0.00E+0	5.50E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	8.29E+1	1.16E+1	5.97E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.07E+0	0.00E+0	1.08E+0	2.10E+0
SM	[kg]	5.79E-1	0.00E+0	4.05E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
NRSF	[MJ]	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
FW	[m³]	3.41E-2	2.12E-3	2.47E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.96E-4	0.00E+0	4.31E-4	1.28E-3

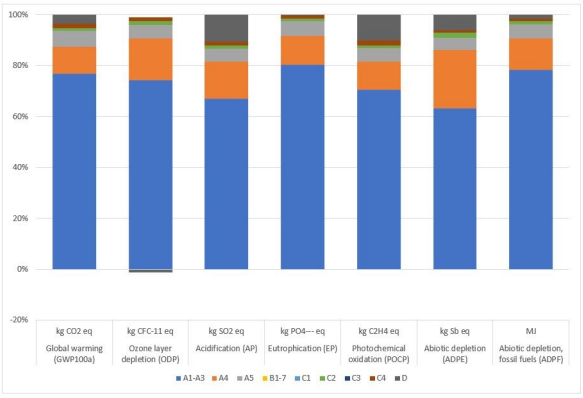
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable 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 – OUTPUT FLOWS AND WASTE CATEGORIES according to EN 15804+A1: 1 m² Bioguard Acoustic (17mm)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	[kg]	1.06E-4	6.52E-6	7.59E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.03E-7	0.00E+0	9.89E-7	-6.40E-6
NHWD	[kg]	9.18E-1	6.63E-1	2.35E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.13E-2	0.00E+0	2.37E+0	-2.55E-3
RWD	[kg]	2.10E-4	7.48E-5	1.56E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.92E-6	0.00E+0	6.12E-6	1.08E-5
CRU	[kg]	0.00E+0	0.00E+0	6.59E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	4.30E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.14E-2
MER	[kg]	0.00E+0	0.00E+0	7.11E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	2.40E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.53E+1	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	3.71E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.64E+1	0.00E+0

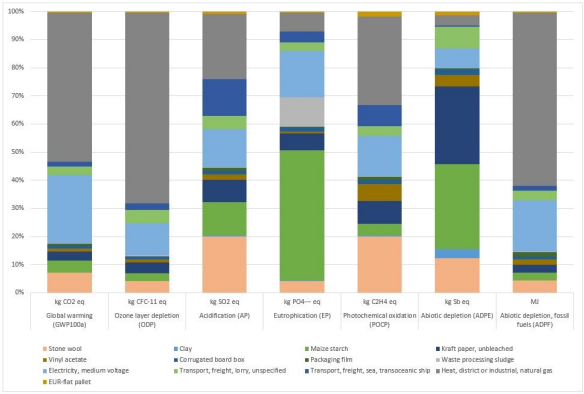
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

6. LCA: Interpretation



The graph shows the individual contributions of the process phases to each environmental impact included in the LCA of the Bioguard Acoustic Ceiling Tile. The graph clearly shows that the module A1-A3 contributes most to the environmental impact of all impact categories. Besides that, A4 and D have a considerable contribution to all impact categories. However, to a lesser extent than A1-3. The cause of the relatively large share of D, is the use of secondary material in A1 and the loss of this secondary material at end of life stage, which is compensated for in module D.

As process phase A1-A3 contributes most, the major contributions within this process phase have been further analysed and presented below. The graph shows that major contributions originate from heat production from natural gas at the production site of Armstrong (dark grey; combustion emissions), the production of stone wool (light orange; direct emissions from production), maize starch production (dark green; maize cultivation and infrastructure for processing) and electricity usage (light blue; major contributor in the electricity mix for Germany is electricity generated by burning brown coal).



7. Requisite evidence

7.1 Biopersistence

Verification of fulfilment of the requirements of annexe IV, Nr. 22 of the /Hazardous Substances Ordinance/ and section 23 of the appendix to § 1 /Chemicals Prohibition Ordinance/ is provided by the RAL quality mark 388 or individual evidence. The following half-life periods were calculated according to EU protocol:
WHO filament fibre (L > 5 µm, D < 3 µm, L/D> 3/1): ≤ 40 days long filament fibre (length > 20 µm, L/D>3/1): < 40 days
Test body: Fraunhofer Institute for Toxicology and Experimental Medicine, 30625 Hanover. ITEM / ITA study no. 02G1307 (10-Jul-2014) / 02G04001 (08-Aug-2007)

7.2 Formaldehyde and VOC emissions

AgBB Overview (28 Days)

The limits according to the /AgBB scheme/ are adhered to

Name	Value	Unit
TVOC (C6 - C16)	1000	µg/m³
Sum SVOC (C16 - C22)	100	µg/m³
R (dimensionless)	1	-
VOC without NIK	100	µg/m³
Carcinogenic Substances	1	µg/m³

Test body: ITB, Poland; Certificate no. 01398/13/Z00NF (07-2013)

7.3 Radioactivity

Radioactivity is not relevant for our products

8. References

/AgBB scheme/: Committee for Health-related Evaluation of Building Products (Ausschuss zur gesundheitlichen Bewertung von Bauprodukten – AgBB), Health-related Evaluation of Emissions of Volatile Organic Compounds (VVOC, VOC and SVOC) from Building Products.

/CEN - EN 717-1/: Wood based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method.

/Chemicals Prohibition Ordinance/: (Nr. 23 of the Annex to §1): Ordinance on bans and restrictive measures for the marketing of hazardous substances, preparations and products according to the Chemicals Act.

/Commission Decision on the European List of Waste/: COM 2000/532/EC.

/DIN 18177/: DIN 18177: 2012-11, Wet felt factory-produced mineral panels - Characteristics and test methods.

/Ecoinvent 3.3/: Originally released August 2016,

implemented in SimaPro, PRé Sustainability, December 2016.

/EN 13501-1/: EN 13501-1:2007, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

/EN 13964/: EN 13964: 2014, Suspended ceilings - Requirements and test methods.

/EN 15804/: EN 15804:2012+A1:2014, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

/EN ISO 10848-2/: EN ISO 10848-2: 2006, Acoustics - Laboratory measurement of the flanking transmission of airborne and impact sound between adjoining rooms.

/EN ISO 11654/: EN ISO 11654: 1997, Acoustics - Sound absorbers for use in buildings - Rating of sound absorption.

/EN ISO 11654/: EN ISO 11654: 1997, Acoustics — Sound absorbers for use in buildings — Rating of sound absorption.

/EN ISO 354/: EN ISO 354: 2003, Acoustics - Measurement of sound absorption in a reverberation room.

/EN ISO 717-1/: EN ISO 717-1: 2013, Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation.

European Chemicals Agency (ECHA)/: Candidate List/ of Substances of Very High Concern (SVHC) for Authorisation: https://echa.europa.eu/candidate-list-table (date: 16.07.2019; 201 substances listed).

/European Waste Code/: European Waste Code 17 09 04, Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03.

/Formaldehyde and VOC emissions/: Product emission test with AgBB/DIBt test protocol.

/Hazardous Substances Ordinance/: (Annex iv, nr 22): Ordinance on the protection against hazardous substances.

/IBU, 2018 PCR Part-A v1.7/: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report.

/IBU, 2017 PCR Part-B v1.6/: Requirements on the EPD for Mineral panels".

/ISO 14001/: ISO 14001: 2015, Environmental management systems - Requirements with guidance for use.

/ISO 14040/: ISO 14040: 2006, Environmental management. Life cycle assessment - Principles and framework.

/ISO 14044/: ISO 14044: 2006, Environmental management. Life cycle assessment – Requirements and Guidelines.

/ISO 21930/: ISO 21930: 2017, Sustainability in building construction -- Environmental declaration of building products.

/ISO 9001/: ISO 9001: 2015, Quality management systems - Requirements.

/RAL quality mark 388/: Products made of mineral wool.

Regulation (EC) No 1907/2006/: of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

/Regulation (EU) No. 305/2011 (CPR)/: European regulation of 9 March 2011 that lays down harmonised conditions for the marketing of construction products.

/SimaPro 9.0/: PRé Sustainability, Amersfoort, The Netherlands, 2019.

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