Environmental Product Declaration

In accordance with 14025, ISO 21930 and EN 15804

Armourcoat Acoustic System

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-04391
Publication date:	2021-08-19
Valid until:	2026-07-23

GENERAL INFORMATION

Manufacturer	Armourcoat Ltd
Address	Unit 2 / 3a Morewood Close, Sevenoaks TN13 2HU
Contact details	technical@armourcoat.co.uk
Website	www.armourcoat.com

PRODUCT IDENTIFICATION

Product name	Armourcoat Acoustic System
Additional label(s)	Armourcoat Seamless Acoustic plaster
Product number / reference	Acoustic Topcoat AP335 / AP347
Place(s) of production	Armourcoat Factory Marden
CPC code	37129 - 37990

EPD INFORMATION

The EPD owner has the sole ownership, liability, and responsibility for the EPD. Construction products EPDs may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

EPD program operator	The International EPD System
EPD standards	This EPD is in accordance with EN 15804+A2 and ISO 14025 standards.
Product category rules	The CEN standard EN 15804+A2 serves as the core PCR. PCR 2019:14. Construction Products. Version 1.1. Sub PCR-C- Acoustic Systems solutions
EPD author	Duncan Mackellar, Armourcoat Ltd
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
Verification date	23/07/2021
EPD verifier	Dr Andrew Norton – Renuables Ltd
EPD number	S-P-04391
Publishing date	19/08/2021
EPD valid until	23/07/2026

PRODUCT DESCRIPTION

The Armourcoat acoustic plaster system offers a clean and aesthetically pleasing seamless solution to interior acoustic for both flat and curved surfaces. It has been developed to offer outstanding performance and is largely made from recycled materials for a truly sustainable solution to managing reverberation.
Good management of the acoustic in interior spaces creates a significantly more pleasant sound environment which positively affects health and well-being.
The system comprises of a glass-wool panel made from recycled glass that has been coated with a 5mm layer of expanded recycled glass granules that form a rigid yet flexible layer on the surface. These panels are adhered to the substrate with a gypsum based adhesive and the joints filled and sanded.
The Acoustic Topcoat plasters are made from fine granular recycled marble which creates a micro-porous layer that allows the sound waves and energy to pass through the surface and be absorbed and attenuated in the layer of mineral wool beneath the surface. The final finish is applied by trowel as a continuous seamless surface and once dry creates a smooth monolithic appearance.
Armourcoat Acoustic Plaster System can be pigmented to a wide range of colours and certain custom surface textures are also possible.

PRODUCT APPLICATION

Armourcoat acoustic is designed to absorb sound energy and reduce reverberation within interior spaces. Reducing reverberation time makes speech and music more intelligible and dramatically improves sound quality. It is ideally suited to spaces where people meet or congregate such as museums, galleries, entrance halls, offices, meeting rooms, restaurants and bars creating a calm and inviting environment.

TECHNICAL SPECIFICATIONS

Bondplast Adhesive:
Powder product
Pack Size -20kg
Set time - 90-150 minutes
Recycled Content -0%
Shelf Life - 12 months

Acoustic boards:
28mm system
Board Dimensions 1000 x 600mm +/-3mm
Board thickness 26.5 mm +/- 0.5mm
Recycled content - 74%
48mm system
Board Dimensions 1000 x 600mm +/-3mm
Board thickness 46.5mm +/- 0.5mm
No shelf Life
Recycled Content -72%

Acoustic topcoat plaster:
AP335, AP 347
Solids content 74.5% +/- 1%
PH - 8.5- 9.5
Density (mixed) 1.15-1.35 g/cm^3
Viscosity 30,000 cps +/- 10%
Shelf Life -12 months
recycled content (dry) 94%

PRODUCT STANDARDS

Acoustic performance

System Thickness	kg / m^2	NRC	Alpha w (Aw)	Acoustic absorption class
28mm	7	0.85	0.8	Class B
48mm	8.75	0.95	0.95	Class A

Fire rating:
UK - BS476 part 6 & 7 - Class 0
European Resistance to fire EN ISO 13501 -1 2007 A2 S1 D0 for full system.
Acoustic Topcoat plaster tested for calorific value to EN ISO 1716 0.151 mj/kg
American Fire ASTM E84-20 Flame spread classification Class A Flame Spread Index-15 Smoke Spread Index -5
Australian Fire testing - Non Combustible AS/NZA3837:1998 Class 1

Zero VOC as tested to ISO 11890-2
ISO 11890-2 = <1.0 VOC (grams/litre)
Limit of detection = 1g/L
Coverage Rate:
Acoustic plaster AP335: 3-3.5kg/m^2
Acoustic Plaster AP347: 3-3.5kg/m^2

PHYSICAL PROPERTIES OF THE PRODUCT

- natural mineral system
- zero VOCs
- seamless finish up to 200m^2 without joints (dependent upon size of application team, application temperature and humidity)
- resistant to mould and mildew
- non combustible
- ultra matt surface
- durable marble plaster finish
- wide range of colours available
- pre- consumer recycled marble
- High recycled content

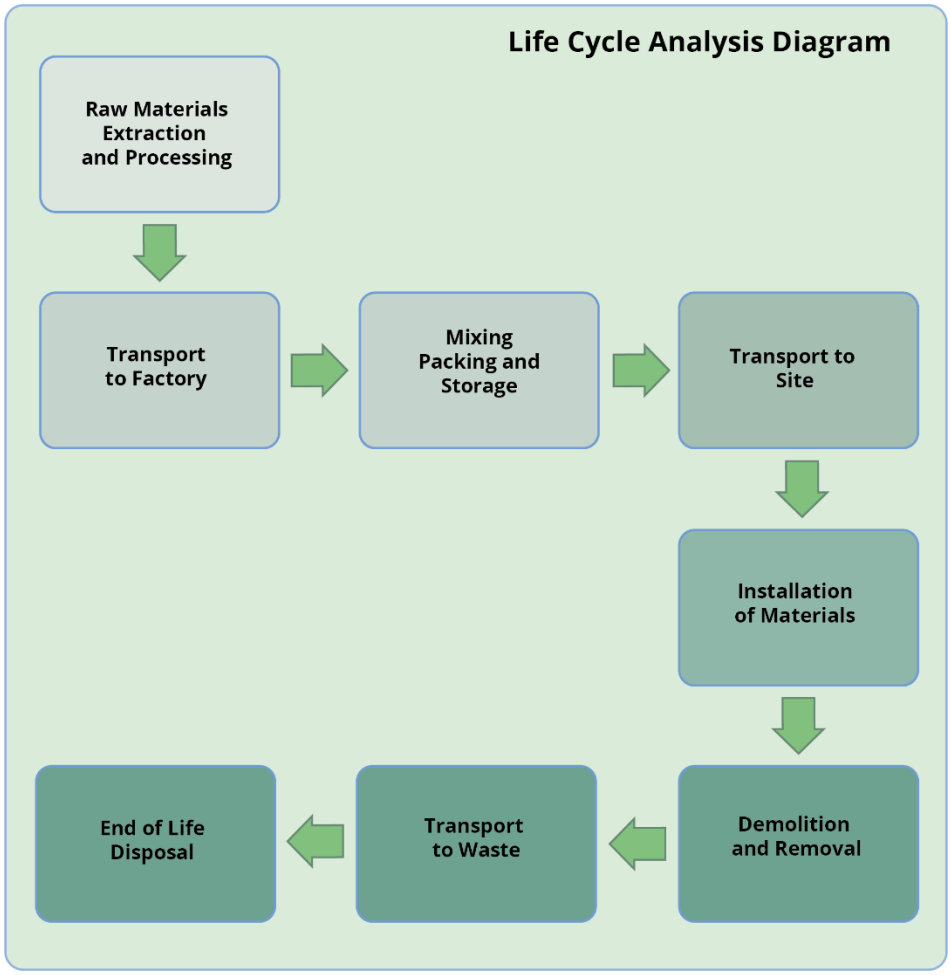
ADDITIONAL TECHNICAL INFORMATION

Further information can be found at armourcoat.com

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

PRODUCT LIFE-CYCLE



MANUFACTURING AND PACKAGING (A1-A3)

A1 Raw materials

This module represents the extraction and processing of all the raw materials used in the manufacturing of the various components that make up the Armourcoat Acoustic system.
All raw material are accounted for with no exceptions and this includes Glasswool, recycled glass granulate, fine granulated crushed marble, gypsum , acrylic binder, and minor additives.

A2 Transport

This covers the transport of all raw materials to the Armourcoat factory including road, rail and sea freight.

A3 Manufacturing

This stage is broken into the manufacture of the various components that make up the Armourcoat Acoustic system.
Bondplast is mixed in a U trough mixer and packaged into paper sacks which are then packaged onto pallets.
The board coating is mixed and coated onto the glasswool boards. These are then dried, processed and packaged onto pallets.
The Acoustic Topcoat is mixed in a high shear paste mixer and packaged into 24kg plastic buckets which are shrink-wrapped onto pallets ready for distribution.
The energy consumption for the mixing, processing and packaging of all processes has been measured and declared.
All raw material packaging waste, packaging materials for the products along with plastic film and wooden pallets have been accounted for.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

A4 Transport

The various components of the Armourcoat acoustic plaster system are manufactured in our Factory in the UK and transported by road for projects in the UK.
Armourcoat products are shipped by sea for overseas projects. Transportation impacts occurred from final products delivery to construction site (A4) to cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions. The transportation distance is defined according to PCR. Average distance of transportation from production plant to building site is assumed as 100 km and the transportation method is assumed to be lorry.

A5 Installation

This module allows for water consumed in the mixing process of the Bondplast along with disposal of all product and packaging waste.
The energy for plaster mixers has also been included but no allowance has been made for the site heating or lighting.

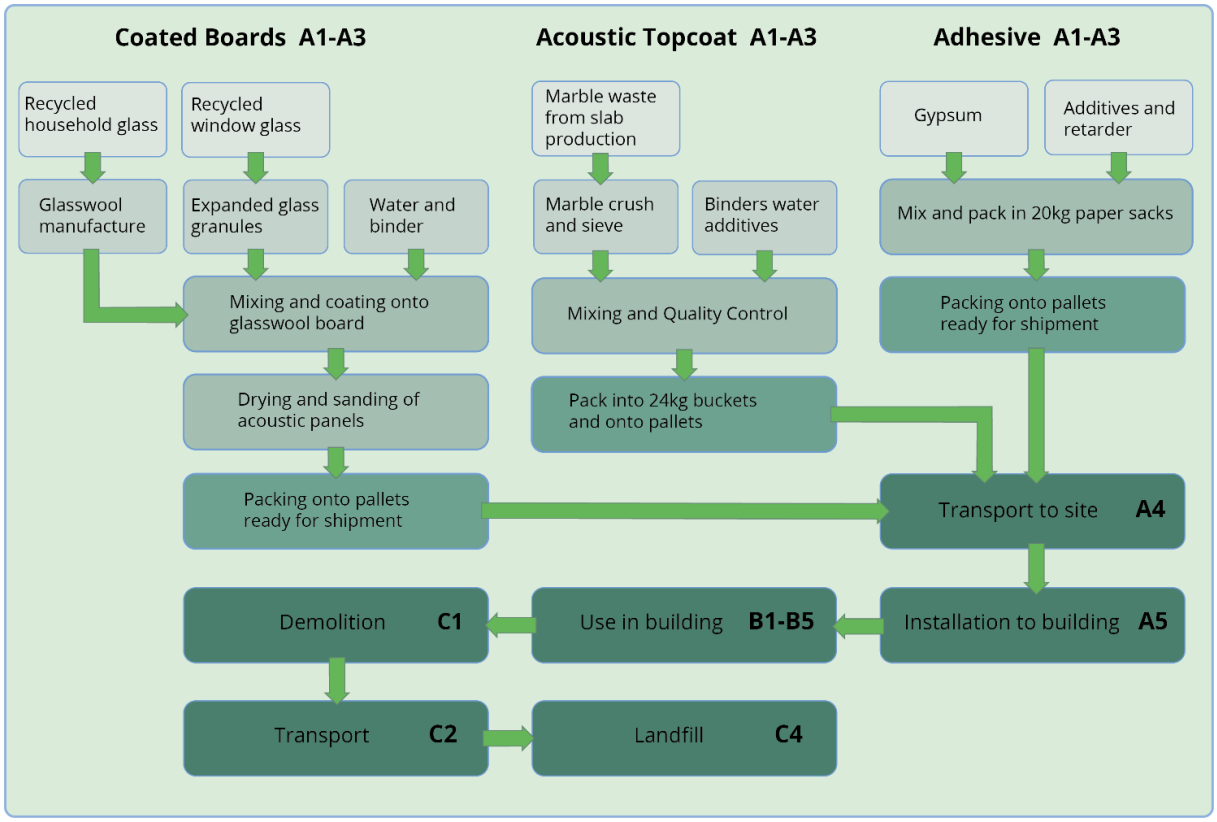
PRODUCT USE AND MAINTENANCE (B1-B7)

This EPD does not cover the use phase. Air, soil and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

The consumption of energy and natural resources is considered negligible for the removal of the acoustic system and plasterboard substrates so the impacts of demolition are assumed zero (C1).
It is assumed that the waste will be transported to the nearest construction waste treatment plant. This is assumed to be 50km. (C2)
There is no waste processing for reuse , recovery or recycling (C3)
It is impractical to separate the various components of the system or remove it effectively from the substrate and therefore it is assumed that it will be disposed of at end of life with the the other inert mineral construction waste. (C4)
There are no benefits and loads beyond the system boundaries (C5)

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT INFORMATION

Period for data	2020-2021

DECLARED AND FUNCTIONAL UNIT

Declared unit	1m^2
Mass per declared unit	7.24kg
Functional unit	1m^2
Reference service life	60 years

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0.0074
Biogenic carbon content in packaging, kg C	0.0025

SYSTEM BOUNDARY

This EPD covers the cradle to gate with options scope with following modules; A1 (Raw material supply), A2 (Transport) and A3 (Manufacturing), A4 (Transport), A5 (Assembly) as well as C1 (Deconstruction), C2 (Transport at end-of-life), C3 (Waste processing) and C4 (Disposal). In addition, module D - benefits and loads beyond the system boundary is included.

Product stage			**Assembly stage**		**Use stage**							**End of life stage**				**Beyond the system boundaries**		
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**	**D**	**D**
x	**x**	**x**	**x**	**x**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**x**	**x**	**x**	**x**	**x**	**x**	**x**
Geography, by two-letter ISO country code or regions. The International EPD System only.																		
EU	**EU**	**EU**	**EU**	**EU**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**EU**	**EU**	**EU**	**EU**	**EU**		
Raw materials	**Transport**	**Manufacturing**	**Transport**	**Assembly**	**Use**	**Maintenance**	**Repair**	**Replacement**	**Refurbishment**	**Operational energy use**	**Operational water use**	**Deconstr./demol.**	**Transport**	**Waste processing**	**Disposal**	**Reuse**	**Recovery**	**Recycling**

Modules not declared = MND. Modules not relevant = MNR.

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019 and the applied PCR. The study does not exclude any hazardous materials or substances.
The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.
All environmental issues relating to both the upstream and downstream processes of the Armourcoat Acoustic System along with all waste and emissions have been included in this EPD.
All raw materials according to the product formula, including their respective energy demands and waste generation during production have been considered, as well as the main packaging materials used to prepare the final product for distribution. All ingredients in section A1-A3 have been included with the exception of the biocide which has an addition level of 0.015%.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation.
In this study, as per EN 15804, allocation is conducted in the following order;
1. Allocation should be avoided.
2. Allocation should be based on physical properties (e.g. mass, volume) when the difference in revenue is small.
3. Allocation should be based on economic values.

Each of the components of the acoustic system are made in just one location and on the same manufacturing/ processing equipment.
All data for the respective processes was accurately measured and recorded and therefore no allocations or estimates were used in the LCA study used to support this EPD.
Allocation used in Ecoinvent 3.6 environmental data sources follows the methodology 'allocation, cut-off by classification'. This methodology is in line with the requirements of the EN 15804 - standard.

AVERAGES AND VARIABILITY

Specific results are declared for the two different thicknesses of system and there is only one manufacture location for each of the components and therefore there are no averages or variability in the results

The International EPD System additional data requirements
Data specificity and GWP-GHG variability for GWP-GHG for A1-A3.

Supply-chain specific data for GWP-GHG	>90 %
Variation in GWP-GHG between products	N/A
Variation in GWP-GHG between sites	N/A

ENVIRONMENTAL IMPACT DATA - 28mm Armourcoat system for 1m²
Note: additional environmental impact data may be presented in annexes.
CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP – total	kg CO2e	3.7E0	3.21E-1	1.46E-1	4.17E0	1.2E-1	1.89E-2	MND	3.51E-8	2.96E-2	3.51E-8	7.71E-2	-3.51E-8
GWP – fossil	kg CO2e	3.66E0	3.2E-1	1.49E-1	4.12E0	1.21E-1	1.64E-2	MND	3.43E-8	2.95E-2	3.43E-8	6.85E-2	-3.43E-8
GWP – biogenic	kg CO2e	4.73E-2	7.5E-4	-3.15E-3	4.49E-2	6.44E-5	2.52E-3	MND	7E-10	2.15E-5	7E-10	8.55E-3	-7E-10
GWP – LULUC	kg CO2e	2.54E-3	2.07E-4	1.54E-4	2.9E-3	4.28E-5	3.7E-6	MND	5.66E-11	8.89E-6	5.66E-11	3.29E-5	-5.66E-11
Ozone depletion pot.	kg CFC11e	3.98E-7	6.31E-8	3.09E-8	4.92E-7	2.74E-8	1.25E-9	MND	3.04E-15	6.94E-9	3.04E-15	2.13E-8	-3.04E-15
Acidification potential	mol H+e	2.8E-2	2.35E-3	6.28E-4	3.09E-2	4.93E-4	3.56E-5	MND	2E-10	1.24E-4	2E-10	5.84E-4	-2E-10
EP-freshwater[2)]	kg Pe	1.15E-4	6.4E-6	5.95E-6	1.27E-4	1.01E-6	1.05E-7	MND	2.81E-12	2.4E-7	2.81E-12	1.2E-6	-2.81E-12
EP-marine	kg Ne	3.16E-3	7.18E-4	1.16E-4	4E-3	1.47E-4	1.18E-5	MND	3.19E-11	3.74E-5	3.19E-11	1.98E-4	-3.19E-11
EP-terrestrial	mol Ne	9.05E-2	7.95E-3	1.23E-3	9.97E-2	1.62E-3	1.27E-4	MND	3.7E-10	4.13E-4	3.7E-10	2.18E-3	-3.7E-10
POCP (“smog”)	kg NMVOCe	1.06E-2	2.25E-3	4.69E-4	1.33E-2	4.95E-4	3.64E-5	MND	1.16E-10	1.33E-4	1.16E-10	6.3E-4	-1.16E-10
ADP-minerals & metals	kg Sbe	2.39E-4	7.75E-6	4.08E-6	2.51E-4	3.26E-6	5.57E-8	MND	1.01E-12	5.04E-7	1.01E-12	7.36E-7	-1.01E-12
ADP-fossil resources	MJ	5.31E1	7.28E0	8.96E0	6.93E1	1.82E0	1.19E-1	MND	5.86E-7	4.59E-1	5.86E-7	1.61E0	-5.86E-7
Water use[1)]	m3e depr.	1.29E0	2.84E-2	8.65E-2	1.4E0	5.86E-3	3.27E-3	MND	2.06E-6	1.71E-3	2.06E-6	7.21E-2	-2.06E-6

1) GWP = Global Warming Potential; EP = Eutrophication potential; POCP = Photochemical ozone formation; ADP = Abiotic depletion potential. 2) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator. 3) Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e.

ENVIRONMENTAL IMPACT DATA - 48mm system for 1m²

Note: additional environmental impact data may be presented in annexes.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP – total	kg CO2e	6E0	3.06E-1	1.46E-1	6.46E0	1.5E-1	1.89E-2	MND	3.51E-8	3.68E-2	3.51E-8	9.41E-2	-3.51E-8
GWP – fossil	kg CO2e	5.91E0	3.05E-1	1.49E-1	6.36E0	1.52E-1	1.64E-2	MND	3.43E-8	3.68E-2	3.43E-8	8.54E-2	-3.43E-8
GWP – biogenic	kg CO2e	8.93E-2	7.39E-4	-3.15E-3	8.69E-2	8.09E-5	2.52E-3	MND	7E-10	2.67E-5	7E-10	8.69E-3	-7E-10
GWP – LULUC	kg CO2e	4.25E-3	2.03E-4	1.54E-4	4.6E-3	5.38E-5	3.7E-6	MND	5.66E-11	1.11E-5	5.66E-11	4.1E-5	-5.66E-11
Ozone depletion pot.	kg CFC11e	6.56E-7	5.96E-8	3.09E-8	7.46E-7	3.45E-8	1.25E-9	MND	3.04E-15	8.65E-9	3.04E-15	2.65E-8	-3.04E-15
Acidification potential	mol H+e	5.24E-2	2.28E-3	6.28E-4	5.53E-2	6.2E-4	3.56E-5	MND	2E-10	1.55E-4	2E-10	7.28E-4	-2E-10
EP-freshwater[2)]	kg Pe	2.03E-4	6.28E-6	5.95E-6	2.15E-4	1.27E-6	1.05E-7	MND	2.81E-12	2.99E-7	2.81E-12	1.49E-6	-2.81E-12
EP-marine	kg Ne	5.54E-3	6.99E-4	1.16E-4	6.36E-3	1.84E-4	1.18E-5	MND	3.19E-11	4.66E-5	3.19E-11	2.47E-4	-3.19E-11
EP-terrestrial	mol Ne	1.76E-1	7.75E-3	1.23E-3	1.85E-1	2.03E-3	1.27E-4	MND	3.7E-10	5.15E-4	3.7E-10	2.72E-3	-3.7E-10
POCP (“smog”)	kg NMVOCe	1.81E-2	2.19E-3	4.69E-4	2.07E-2	6.23E-4	3.64E-5	MND	1.16E-10	1.65E-4	1.16E-10	7.85E-4	-1.16E-10
ADP-minerals & metals	kg Sbe	4.1E-4	1E-5	4.08E-6	4.24E-4	4.1E-6	5.57E-8	MND	1.01E-12	6.28E-7	1.01E-12	9.17E-7	-1.01E-12
ADP-fossil resources	MJ	6.95E1	9.35E0	8.96E0	8.78E1	2.29E0	1.19E-1	MND	5.86E-7	5.72E-1	5.86E-7	2.01E0	-5.86E-7
Water use[1)]	m3e depr.	2.21E0	2.76E-2	8.65E-2	2.32E0	7.36E-3	3.27E-3	MND	2.06E-6	2.13E-3	2.06E-6	8.98E-2	-2.06E-6

1) GWP = Global Warming Potential; EP = Eutrophication potential; POCP = Photochemical ozone formation; ADP = Abiotic depletion potential. 2) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator. 3) Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF – 28MM SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate matter	Incidence	2.03E-7	2.45E-8	5.51E-9	2.33E-7	8.41E-9	8.07E-10	MND	1.68E-15	2.67E-9	1.68E-15	1.12E-8	-1.68E-15
Ionizing radiation[3)]	kBq U235e	5.67E-1	2.29E-2	9.06E-2	6.81E-1	7.95E-3	9.66E-4	MND	4.05E-9	2.01E-3	4.05E-9	6.31E-3	-4.05E-9
Ecotoxicity (freshwater)	CTUe	8.34E1	4.09E0	2.99E0	9.05E1	1.4E0	1.08E-1	MND	6.25E-7	3.51E-1	6.25E-7	1.16E0	-6.25E-7
Human toxicity, cancer	CTUh	8.93E-9	1.77E-10	1.34E-10	9.24E-9	4.08E-11	7.48E-12	MND	9.37E-17	8.98E-12	9.37E-17	4.21E-11	-9.37E-17
Human tox. non-cancer	CTUh	4.62E-8	4.68E-9	2.27E-9	5.31E-8	1.59E-9	1.14E-10	MND	2.09E-15	4.16E-10	2.09E-15	8.8E-10	-2.09E-15
SQP	-	6.42E0	4.5E0	3.75E-1	1.13E1	1.52E0	2.42E-1	MND	5.17E-8	6.94E-1	5.17E-8	5.75E0	-5.17E-8

4) SQP = Land use related impacts/soil quality.5) EN 15804+A2 disclaimer for Ionizing radiation, human health. 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 nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF – 48MM SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate matter	Incidence	3.85E-7	2.32E-8	5.51E-9	4.14E-7	1.06E-8	8.07E-10	MND	1.68E-15	3.33E-9	1.68E-15	1.4E-8	-1.68E-15
Ionizing radiation[3)]	kBq U235e	9.6E-1	2.19E-2	9.06E-2	1.07E0	1E-2	9.66E-4	MND	4.05E-9	2.5E-3	4.05E-9	7.86E-3	-4.05E-9
Ecotoxicity (freshwater)	CTUe	1.48E2	3.91E0	2.99E0	1.55E2	1.77E0	1.08E-1	MND	6.25E-7	4.38E-1	6.25E-7	1.44E0	-6.25E-7
Human toxicity, cancer	CTUh	1.8E-8	1.72E-10	1.34E-10	1.83E-8	5.13E-11	7.48E-12	MND	9.37E-17	1.12E-11	9.37E-17	5.25E-11	-9.37E-17
Human tox. non-cancer	CTUh	8.24E-8	4.47E-9	2.27E-9	8.91E-8	2E-9	1.14E-10	MND	2.09E-15	5.19E-10	2.09E-15	1.1E-9	-2.09E-15
SQP	-	1.12E1	4.15E0	3.75E-1	1.57E1	1.9E0	2.42E-1	MND	5.17E-8	8.64E-1	5.17E-8	7.17E0	-5.17E-8

4) SQP = Land use related impacts/soil quality.5) EN 15804+A2 disclaimer for Ionizing radiation, human health. 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 nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

USE OF NATURAL RESOURCES – 28MM SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Renew. PER as energy	MJ	2.4E1	2.11E-1	5.18E0	2.94E1	2.57E-2	7.66E-3	MND	7.95E-8	5.78E-3	7.95E-8	2.66E-2	-7.95E-8
Renew. PER as material	MJ	3.92E-3	0E0	8.5E-2	8.89E-2	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Total use of renew. PER	MJ	2.4E1	2.11E-1	5.26E0	2.95E1	2.57E-2	7.66E-3	MND	7.95E-8	5.78E-3	7.95E-8	2.66E-2	-7.95E-8
Non-re. PER as energy	MJ	4.44E1	7.28E0	7.25E0	5.9E1	1.82E0	1.19E-1	MND	5.86E-7	4.59E-1	5.86E-7	1.61E0	-5.86E-7
Non-re. PER as material	MJ	1.02E1	0E0	1.71E0	1.19E1	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Total use of non-re. PER	MJ	5.47E1	7.28E0	8.96E0	7.09E1	1.82E0	1.19E-1	MND	5.86E-7	4.59E-1	5.86E-7	1.61E0	-5.86E-7
Secondary materials	kg	2.35E0	0E0	4.22E-4	2.35E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Renew. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Non-ren. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m3	2.85E-2	1.68E-3	1.99E-3	3.21E-2	3.11E-4	9.76E-5	MND	1.17E-7	9.57E-5	1.17E-7	1.82E-3	-1.17E-7

6) PER = Primary energy resources

USE OF NATURAL RESOURCES – 48MM SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Renew. PER as energy	MJ	4.39E1	2.37E-1	5.18E0	4.93E1	3.23E-2	7.66E-3	MND	7.95E-8	7.21E-3	7.95E-8	3.31E-2	-7.95E-8
Renew. PER as material	MJ	7.53E-3	0E0	8.5E-2	9.25E-2	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Total use of renew. PER	MJ	4.39E1	2.37E-1	5.26E0	4.94E1	3.23E-2	7.66E-3	MND	7.95E-8	7.21E-3	7.95E-8	3.31E-2	-7.95E-8
Non-re. PER as energy	MJ	6.18E1	9.35E0	7.25E0	7.84E1	2.29E0	1.19E-1	MND	5.86E-7	5.72E-1	5.86E-7	2.01E0	-5.86E-7
Non-re. PER as material	MJ	1.08E1	0E0	1.71E0	1.25E1	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Total use of non-re. PER	MJ	7.26E1	9.35E0	8.96E0	9.09E1	2.29E0	1.19E-1	MND	5.86E-7	5.72E-1	5.86E-7	2.01E0	-5.86E-7
Secondary materials	kg	3.35E0	0E0	4.22E-4	3.35E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Renew. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Non-ren. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m3	4.44E-2	2.11E-3	1.99E-3	4.85E-2	3.91E-4	9.76E-5	MND	1.17E-7	1.19E-4	1.17E-7	2.27E-3	-1.17E-7

6) PER = Primary energy resources

END OF LIFE – WASTE – 28MM SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste	Kg	5.96E-2	1.27E-2	9.91E-3	8.22E-2	1.85E-3	3.81E-4	MND	3.44E-9	4.46E-4	0E0	2.82E-3	-3.44E-9
Non-hazardous waste	Kg	1.33E0	7.68E-1	3.71E-1	2.47E0	1.27E-1	2.49E-1	MND	1.25E-7	4.94E-2	0E0	6.5E0	-1.25E-7
Radioactive waste	Kg	1.23E-4	4.84E-5	6.81E-5	2.4E-4	1.25E-5	7.92E-7	MND	3.16E-12	3.15E-6	0E0	9.68E-6	-3.16E-12

END OF LIFE – WASTE – 48MM SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste	Kg	5.96E-2	1.47E-2	9.91E-3	8.43E-2	2.32E-3	3.81E-4	MND	3.44E-9	5.56E-4	0E0	3.52E-3	-3.44E-9
Non-hazardous waste	Kg	1.34E0	9.91E-1	3.71E-1	2.7E0	1.59E-1	2.49E-1	MND	1.25E-7	6.15E-2	0E0	8.1E0	-1.25E-7
Radioactive waste	Kg	1.38E-4	6.26E-5	6.81E-5	2.69E-4	1.57E-5	7.92E-7	MND	3.16E-12	3.93E-6	0E0	1.21E-5	-3.16E-12

END OF LIFE – OUTPUT FLOWS – 28MM SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	Kg	0E0	0E0	0E0	0E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	Kg	3.71E-2	0E0	0E0	3.71E-2	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Materials for energy rec	Kg	0E0	0E0	0E0	0E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0

END OF LIFE – OUTPUT FLOWS – 48MM SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Components for re-use	Kg	0E0	0E0	0E0	0E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	Kg	7.13E-2	0E0	0E0	7.13E-2	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Materials for energy rec	Kg	0E0	0E0	0E0	0E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	0E0	0E0	0E0	0E0	0E0

ENVIRONMENTAL IMPACTS – GWP-GHG - THE INTERNATIONAL EPD SYSTEM – 28MM SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP-GHG	kg CO2e	3.66E0	3.2E-1	1.49E-1	4.12E0	1.21E-1	1.64E-2	MND	3.43E-8	2.95E-2	3.43E-8	6.85E-2	-3.43E-8

8) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013) This indicator Is almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

ENVIRONMENTAL IMPACTS – GWP-GHG - THE INTERNATIONAL EPD SYSTEM – 48MM SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP-GHG	kg CO2e	5.91E0	3.05E-1	1.49E-1	6.36E0	1.52E-1	1.64E-2	MND	3.43E-8	3.68E-2	3.43E-8	8.54E-2	-3.43E-8

8) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013) This indicator Is almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Additional Information Summary

Core environmental impact indicators – EN 15804 +A1 PEF

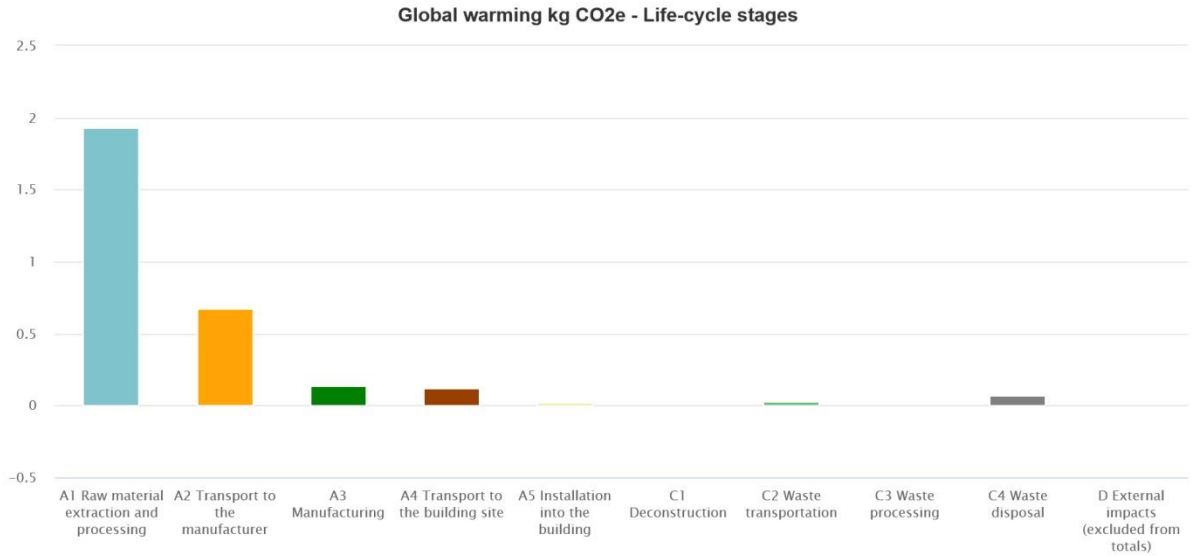
Acoustic system thickness	A1-A3 (Kg CO2)	A1- A5 + C1-4 & D
28mm system	3.36	3.62
48mm system	4.62	4.95

Core environmental impact indicators – EN 15804 +A2 PEF

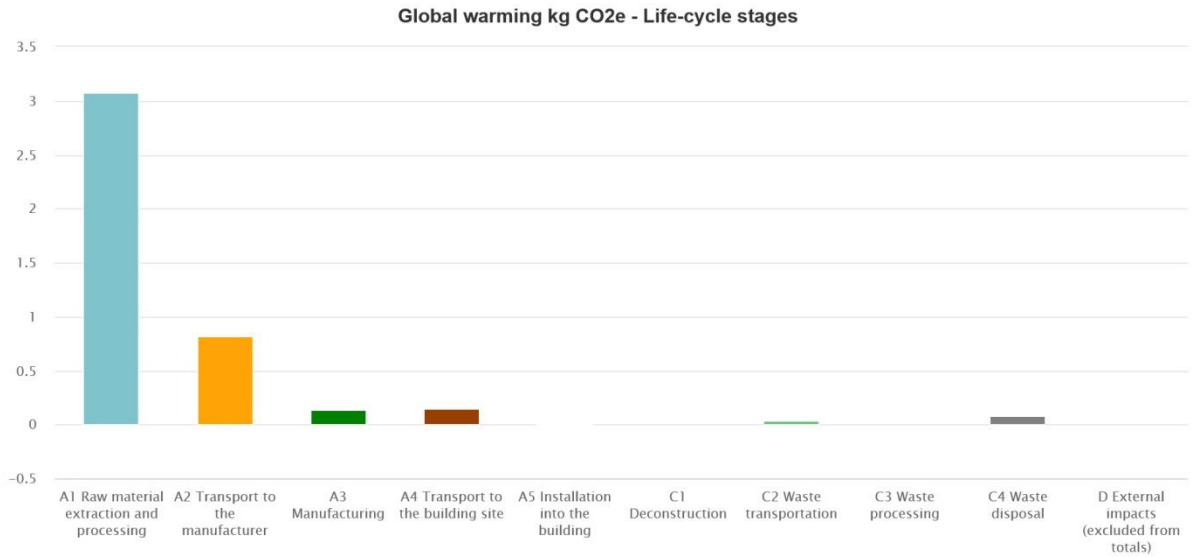
Acoustic system thickness	A1-A3 (Kg CO2)	A1- A5 + C1-4 & D
28mm system	4.19	4.46
48mm system	6.42	6.76

CHART

GWP Lifecycle Stages 28mm System



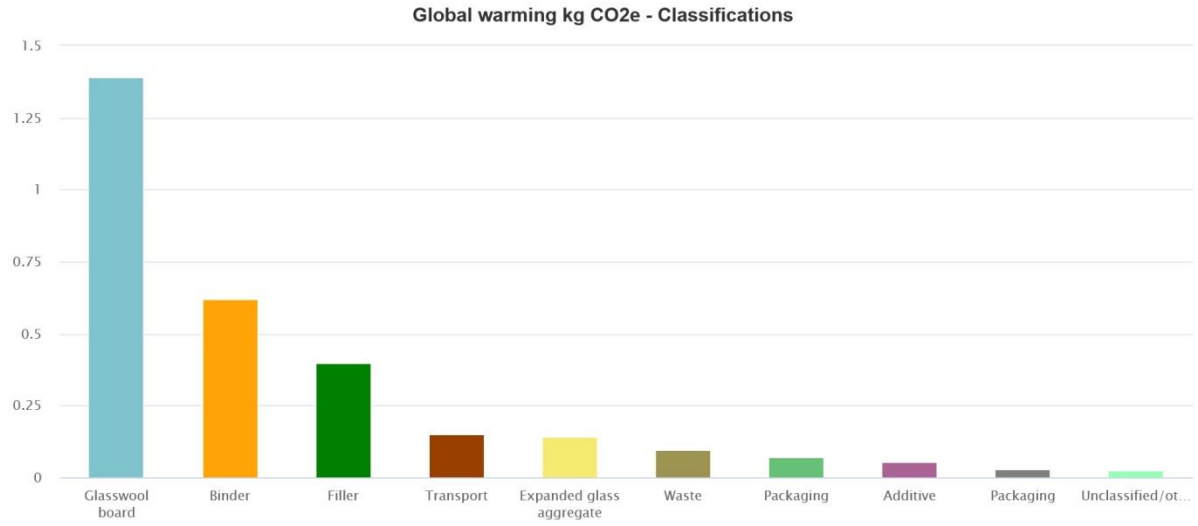
GWP Lifecycle Stages 48mm System



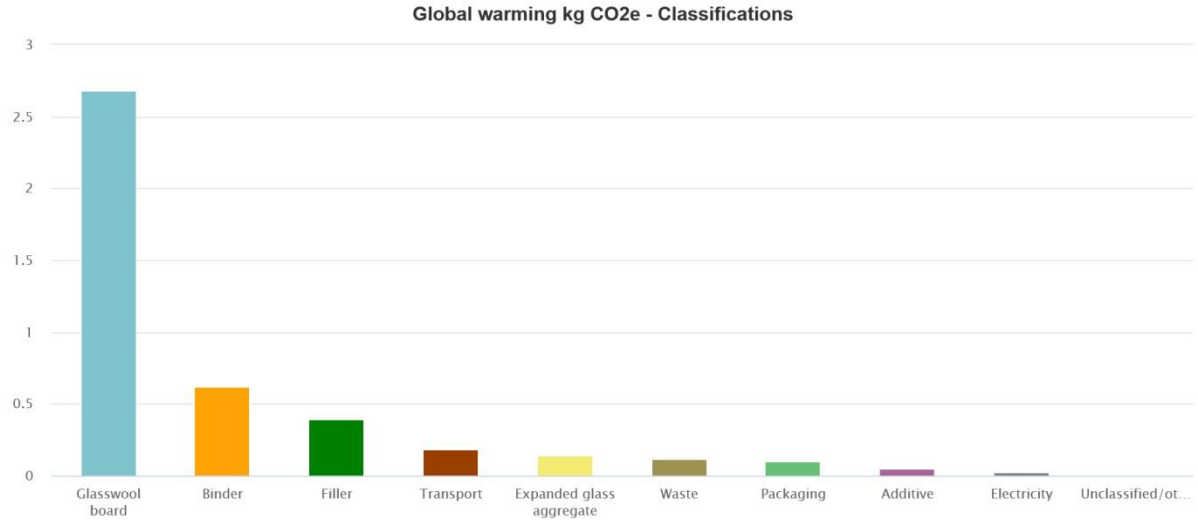
The raw material extraction and processing (A1) Is by far the largest contributor to the GWP with 65% for the 28mm system and 74% for the 48mm system.
The next largest contributor is from the (A2) transportation to the site of manufacturing at 22% for the 28mm system and 15.3% for the 48mm system.
The A3 manufacture stage is relatively low at 4.7% and 3.4% respectively and this is in large part due to the energy mix which is 24% nuclear and 76% renewable energy and therefore not contributing at all to the GWP.

CHART

GWP classifications 28mm system



GWP Classifications 48mm System



The highest contributing material in A1 is the Glasswool board at 62 & 65% respectively even though it is manufactured from more than 60% recycled glass bottles.
The glasswool is also by far the largest constituent of the system.
The next largest contributor is the binder which is from the gypsum and polymer in both the Bondplast adhesive and the board coating.

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality	24% Nuclear, 38% Onshore wind turbine, 38% offshore wind turbine
Electricity CO_2e / kWh Nuclear Electricity CO_2e / kWh Offshore Wind Electricity CO_2e / kWh Onshore Wind	0.0112 CO_2e/KWh 0.0148 CO_2e /KWh 0.0112 CO_2e/KWh
District heating data source and quality	None
District heating CO_2e / kWh	None

BIBLIOGRAPHY

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ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.
ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.

Ecoinvent database v3.6 (2019) and One Click LCA database.
EN 15804:2012+A2:2019 Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products.
The CEN standard EN 15804+A2 serves as the core PCR.
Armourcoat Acoustic System LCA background report 13.07.2021

ABOUT THE MANUFACTURER

Armourcoat Ltd is a Manufacturer and supplier of performance coatings and decorative surface finishes. Armourcoat ltd was incorporated in the UK in 1986 as a specialist manufacturer of ultra-hard plasters and renders for Squash and Rackets courts. In 1990 Armourcoat diversified into a range of decorative plasters and paints and has become the leading company worldwide for specialist decorative plasters and coatings. Armourcoat has offices in the UK and USA and has agents and distributors in over 40 countries around the world. Armourcoat manufactures its products in the UK to ISO9001.

EPD AUTHOR AND CONTRIBUTORS

Manufacturer	Armourcoat Ltd
EPD author	Duncan Mackellar – Armourcoat Ltd
EPD verifier	Dr Andrew Norton – Renuables Ltd
EPD program operator	The International EPD System
Background data EPD	This EPD is based on Ecoinvent 3.6 (cut-off) and One Click LCA databases.
LCA software	The LCA and EPD have been created using One Click LCA software

VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with EN 15804, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The background report (project report) for this EPD

Why does verification transparency matter? Read more online.

VERIFICATION OVERVIEW

Following independent third party has verified this specific EPD:

EPD verification information	**Answer**
Independent EPD verifier	Dr Andrew Norton – Renuables Ltd
EPD verification started on	26/06/2021
EPD verification completed on	23/07/2021
Approver of the EPD verifier	The International EPD System

Author & tool verification	**Answer**
EPD author	Duncan Mackellar – Armourcoat Ltd
EPD author training completion	04/02/2021
EPD Generator module	One Click LCA
Independent software verifier	The International EPD System
Software verification date	17 January 2021

VERIFICATION AND REGISTRATION (ENVIRONDEC)

ISO standard ISO 21930 and CEN standard EN 15804 serves as the core Product Category Rules (PCR)	
PCR	PCR 2019:14 Construction products and services Sub PCR-C- Acoustic Systems solutions
PCR review was conducted by:	The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
Third party verifier	Dr Andrew Norton – Renuables Ltd
Approved by	The International EPD® System Technical Committee, supported by the Secretariat
Procedure for follow-up during EPD validity involves third party verifier	☐ yes ☑ no

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ANNEX 1 : ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930 – 28mm system

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO2e	2.72E0	4.75E-1	1.41E-1	3.34E0	1.2E-1	1.61E-2	MND	3.35E-8	2.93E-2	3.35E-8	6.72E-2	-3.35E-8
Ozone depletion Pot.	kg CFC11e	2.61E-7	8.11E-8	4.55E-8	3.88E-7	2.18E-8	1.06E-9	MND	3.43E-15	5.52E-9	3.43E-15	1.69E-8	-3.43E-15
Acidification	kg SO2e	1.65E-2	1.9E-3	5.98E-4	1.9E-2	2.42E-4	1.82E-4	MND	1.62E-10	6.01E-5	1.62E-10	4.65E-3	-1.62E-10
Eutrophication	kg PO4 3e	3.94E-3	4.52E-4	2.4E-4	4.64E-3	4.97E-5	3.86E-5	MND	9.18E-11	1.21E-5	9.18E-11	9.48E-5	-9.18E-11
POCP (“smog”)	kg C2H4e	9.95E-4	8.37E-5	3.65E-5	1.12E-3	1.59E-5	1.38E-6	MND	1.08E-11	3.81E-6	1.08E-11	1.75E-5	-1.08E-11
ADP-elements	kg Sbe	2.39E-4	7.75E-6	4.08E-6	2.51E-4	3.26E-6	5.57E-8	MND	1.01E-12	5.04E-7	1.01E-12	7.36E-7	-1.01E-12
ADP-fossil	MJ	5.31E1	7.28E0	8.96E0	6.93E1	1.82E0	1.19E-1	MND	5.86E-7	4.59E-1	5.86E-7	1.61E0	-5.86E-7

ANNEX 1 : ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930 – 48MM STSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO2e	3.86E0	6.07E-1	1.41E-1	4.61E0	1.5E-1	1.61E-2	MND	3.35E-8	3.65E-2	3.35E-8	8.37E-2	-3.35E-8
Ozone depletion Pot.	kg CFC11e	3.69E-7	1.06E-7	4.55E-8	5.21E-7	2.74E-8	1.06E-9	MND	3.43E-15	6.88E-9	3.43E-15	2.11E-8	-3.43E-15
Acidification	kg SO2e	2.76E-2	2.17E-3	5.98E-4	3.04E-2	3.04E-4	1.82E-4	MND	1.62E-10	7.49E-5	1.62E-10	5.8E-3	-1.62E-10
Eutrophication	kg PO4 3e	6.43E-3	5.07E-4	2.4E-4	7.18E-3	6.25E-5	3.86E-5	MND	9.18E-11	1.51E-5	9.18E-11	1.18E-4	-9.18E-11
POCP (“smog”)	kg C2H4e	1.63E-3	1.01E-4	3.65E-5	1.77E-3	2E-5	1.38E-6	MND	1.08E-11	4.75E-6	1.08E-11	2.18E-5	-1.08E-11
ADP-elements	kg Sbe	4.1E-4	1E-5	4.08E-6	4.24E-4	4.1E-6	5.57E-8	MND	1.01E-12	6.28E-7	1.01E-12	9.17E-7	-1.01E-12
ADP-fossil	MJ	6.95E1	9.35E0	8.96E0	8.78E1	2.29E0	1.19E-1	MND	5.86E-7	5.72E-1	5.86E-7	2.01E0	-5.86E-7

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