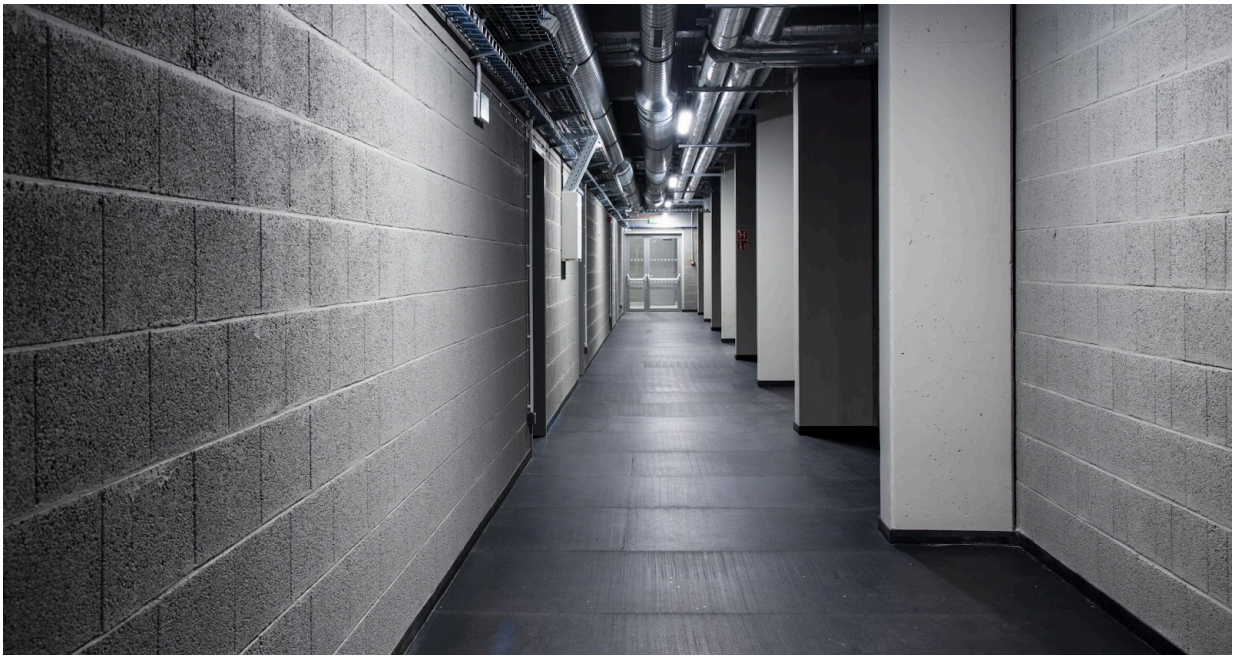
Environmental Product Declaration

EPD of multiple products, based on the average results of the product group

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021:

Lightweight concrete blocks (thermal insulation, load-bearing type)

Programme:	"National programme of environmental labeling "- CZ EPD Database in Czech republic - Ekoznačka.cz
Programme operator:	Ministry of the Environment of the Czech Republic, CENIA
Declaration number:	EPD-NPEZ-B612007
EPD owner:	Liapor s.r.o.
Author:	Envitrail s.r.o.
Publication date:	15.09.2025
Valid until:	14.09.2030



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General information

Programme information

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Additional Product Category Rules (PCR): EN 16757:2022, EN 16783:2024
Life cycle assessment (LCA)
LCA accountability: *Ing. Eva-Žofie Bergmannová, Envitrail s.r.o.*, bergmannova@envitrail.com, *Ing. Miroslava Česká* https://envitrail.com/
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: *Doc. Ing. Jan Weinzettel, Ph.D.*, weinzettel@seznam.cz
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

Statement on the requirements for comparability of EPDs, adapted from ISO 14025:

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

EPD owner:
Liapor s.r.o., Vintířov 176, 357 35 Vintířov, IČO: 46882324

Contact:
Ing. Pavel Bursík, email: bursik@liapor.cz

Description of the organisation:
Liapor s.r.o. is an established manufacturer of Liapor© lightweight ceramic aggregate, Liapor© (ceramic aggregate) based lightweight ceramic concrete masonry units, and other building materials with a long tradition in the Czech Republic. The company is part of a European industrial group active in the research, production, and innovation of building materials that meet high technical and environmental standards. The products are certified and supplied to markets throughout Europe.

Product-related or management system-related certifications:
The quality of products is ensured by an effective quality management system in accordance with ČSN EN ISO 9001 and complies with technical regulations relating to product type EN 771-3+A1:2015.

Product information

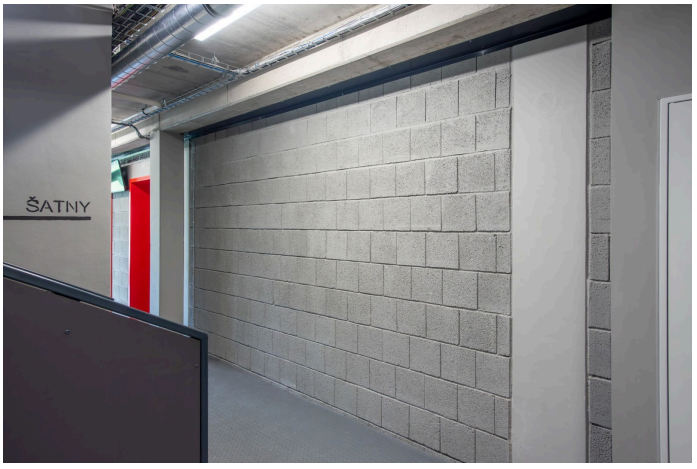
Product name:
Average lightweight concrete blocks: thermal insulation type and load-bearing, acoustic type

UN CPC code:
2399

Product description, function:

Thermal insulation type
This type includes thermal insulation lightweight concrete blocks designed for single-layer perimeter walls. The blocks are made of lightweight Liapor® ceramic aggregate, hydraulic binder, additives, and water. Thanks to their optimized porous composition and low bulk density, the blocks achieve thermal-technical parameters (thickness 365–425 mm, strength class 2–4 MPa). The system enables efficient construction with an emphasis on reducing the energy consumption of the building.

Load-bearing (acoustic) type



Products in this group are designed for internal and external load-bearing structures with requirements for high load-bearing capacity, precision and sound insulation. Shaped blocks (thicknesses 115–365 mm, strength classes 4–12 MPa) are manufactured from a combination of Liapor® ceramic aggregate, natural aggregate, cement, additives and water. The system allows for the design of efficient structures with reduced weight, even in architecturally exposed locations, such as public spaces, corridors, technical and sports facilities. Selected products also allow for an exposed surface without the need for plaster or cladding.

Table 1: Product groups material content specifications

Input materials	Thermal insulation type	Load-bearing (acoustic) type
Lightweight aggregate Liapor© [% mass.]	23 - 52	7 - 45
Binder [% mass.]	32 - 44	18 - 38
Sand [% mass.]	0 - 12	0 - 65
Water* ± 10% [% mass.]	17 - 23	10 -18

**Percentage value includes the amount of water that corresponds to the manufacturing recipe of a product*

Average material content declared in this EPD for both product groups is displayed in Table 4.

Table 2: Technical data

Parameter	Thermal insulation type	Load-bearing (acoustic) type
Thickness [mm]	365 – 425	115 – 365
Bulk density ± 10 % [kg/m^3]	500 – 800	650 – 1530
Thermal conductivity coefficient λ [W/mK]	0.096 – 0.158	0.157 – 0.321
Strength [MPa]	2 – 4	4 – 12
Weighted Sound Reduction Index [db]	52 – 56	45 – 57
Reaction to fire class	A1- non-combustible	A1 - non-combustible

Name and location of production site: Vintířov 176, 357 35 Vintířov

Manufacturing process: The production process takes place in Vintířov and involves mixing the input materials (Liapor aggregate, sand, cement, power plant fly ash, water, and additives), vibropressing, and curing in curing chambers. The finished lightweight concrete blocks are stored on pallets in an open area.

LCA information

Declared unit:

1 m^3 average thermal insulation lightweight concrete block with λ 0.096 – 0.158 W/mK and bulk density 714 kg/m^3

1 m^3 average load-bearing (acoustic) lightweight concrete block with bulk density 1327 kg/m^3

Table 3: Declared unit and conversion factors

	Thermal insulation type	Load-bearing (acoustic) type
Declared unit [m^3]	1	1
Average bulk density [kg/m^3]	714	1327
Conversion factor to 1 kg [m^3/kg]	0.0014	0.0007

Reference service life:
The reference service life of lightweight concrete blocks is assumed to be 50 years.

Time representativeness:
Primary production data represent specific values for the period from January 2024 to December 2024. Secondary and background data are based on the ecoinvent 3.11 cut-off database.

Geographical representativeness:
The geographical scope of the study focuses on the Czech Republic, with a particular emphasis on national and European processes.

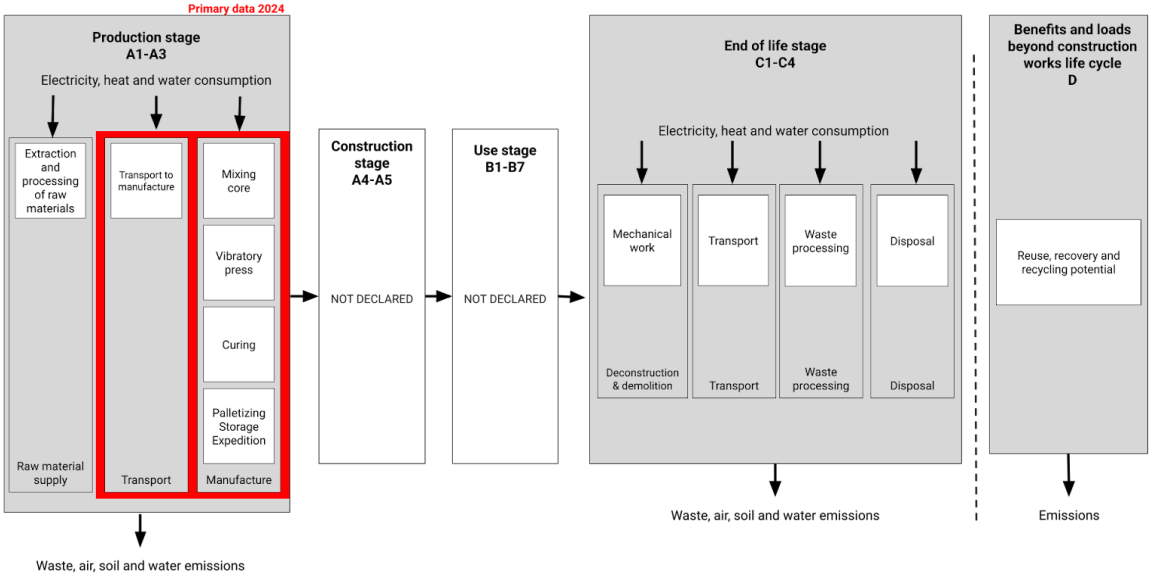
Database(s) and LCA software used:
OpenLCA ver. 2.4 software, database ecoinvent version 3.11, cutoff.

Methodology LCIA:
Environmental Footprint 3.1, EN 15804

Cutoff rules:
All inputs and outputs of unit processes for which data are available are included in the calculation. Environmental impacts related to infrastructure and capital goods are not considered, except for processes included in selected datasets in the database.

Allocation:
For input materials, energy consumption, and output flows, weight allocation was performed based on annual data of total production per declared unit. The ecoinvent database system model for secondary flow allocation uses the selected "polluter pays" principle (PPP).

Description of system boundary:
Cradle-to-gate (A1-A3) with modules C1-C4 and module D.



Declared modules

CONSTRUCTION WORKS ASSESSMENT INFORMATION																
CONSTRUCTION WORKS LIFE CYCLE INFORMATION																SUPPLEMENTARY INFORMATION BEYOND CONSTRUCTION WORKS LIFE CYCLE
A1-A3			A4-A5		B1-B7							C1-C4				D
PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport	Construction and Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operation energy use	Operation water use	Deconstruction & Demolition	Transport	Waste processing	Disposal	Reuse, recovery, recycling potencial
X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X

**ND = Not declared, used for voluntary parameters that are not quantified because of a lack of data.*

The product stage includes the following modules:

- **A1 (Raw material supply)** – Primary data was collected for lightweight concrete blocks by Liapor s.r.o. This module does not include the production of packaging material (packaging material is calculated in module A3).
- **A2 (Transport)** – Module A2 includes the transport of raw materials to the production site. Materials are transported by a lorry (>32 t, 16-32 t, 3,5-7,5 t) and a passenger car.
- **A3 (Manufacturing)** – This module includes the manufacture of the product, auxiliary materials, and packaging. The processing of any waste arising from this stage is also included.

The end of life stage includes modules:

- **C1 (Deconstruction & demolition)** – It is assumed that the Lightweight concrete blocks are incorporated into the structure, and that demolition is carried out using operational services (excavation, sorting).
- **C2 (Transport)** – This module describes the transportation of waste to the waste treatment site. The average freight transportation distance for the Czech Republic is 50.8 km [6].
- **C3 (Waste processing)** – End of life treatment was processed according to the data from the MilieuDatabase [5]. This database contains values for end-of-life treatment scenarios in the construction industry. The amount of recycled material corresponds to 50 % of the product weight.
- **C4 (Disposal)** – The amount of waste disposed of was assessed based on waste management data from the MilieuDatabase [5]. The amount disposed of in landfills corresponds to 50 % of the product's weight.

The benefits and loads beyond the product system – Module D:

The potential benefits and costs of waste utilization are assessed in Module D. Recyclable waste from Modules A3 and C3 is used to calculate the benefits of avoiding the production of primary materials.

Submodule D1 calculates the benefits of using waste as a secondary raw material instead of a primary raw material. This module was calculated for lightweight concrete blocks from module C3 and for plastic waste from module A3.

When waste is incinerated for energy recovery (D3), heat and electricity are produced, which can potentially replace the energy mix in the Czech Republic and the thermal energy produced from coal gas (the baseline process for heat in the Czech Republic in the ecoinvent database). This module was calculated for the incineration of mineral oils, hazardous waste and EUR- palette from module A3.

Modules that were not included (not declared):

- **A4 – A5 (Construction phase)** – Not declared due to its dependence on function during the use phase, which may vary significantly depending on the end customer.
- **B1 – B7 (Use phase)** – Not declared due to optional usage depending on consumer behavior. The carbonation process is not included.

Content information

Table 4: Material distribution of input materials for average lightweight concrete block

Material distribution	Thermal insulation type [% weight]	Load-bearing (acoustic) type [% weight]
Lightweight aggregate Liapor© [% weight]	33.3	17.1
Binder (Cement + fly ash) [% weight]	38.3	27.9
Sand [%weight]	8.3	39.4
Water [%weight]	20.1	15.6

Table 5: Material distribution of packaging materials for average lightweight concrete block

Material distribution	Thermal insulation type			Load-bearing (acoustic) type		
	Amount	Unit	Weight % (versus the product)	Amount	Unit	Weight % (versus the product)
PE foil	0.066	kg/DU	0.009 %	0.174	kg/DU	0.013 %
PET film	0.086	kg/DU	0.012 %	0.214	kg/DU	0.016 %
EUR palette	0.358	piece/DU	1.103 %	0.901	piece/DU	1.494 %

Substances listed as substances of very high concern (SVHC substances), underlying to authorization by the European Chemicals Agency, are not contained in the product in declarable quantities.

Biogenic carbon content

The calculation of biogenic carbon content and conversion to carbon dioxide was performed in accordance with EN 16449 [8] and is based on the distribution of organic components per declared unit of the final product. The content of organic and foreign particles in the lightweight concrete blocks is almost zero due to the heat treatment at high temperatures and sorting through a series of screens. The resulting biogenic carbon content was therefore determined only in the packaging material.

Table 6: Biogenic carbon content

Biogenic carbon content	kg C/1 m^3 thermal insulation type	kg C/1 m^3 load-bearing (acoustic) type
Biogenic carbon content in packaging materials	16.445	41.385
Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2		

Thermal insulation, lightweight concrete blocks

Results of the environmental performance indicators

Table 7: Core environmental impact indicators according to EN 15804 (EF 3.1)

Thermal insulation lightweight concrete block									
Indicator	**Reference unit**	**A1-A3**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
AP	mol H^+-Eq	2.21E+00	ND	ND	2.31E-02	2.52E-02	0	7.84E-04	-6.34E-02
GWP-total	kg CO_2-Eq	2.94E+02	ND	ND	2.58E+00	5.48E+00	0	6.99E-02	-1.32E+01
GWP - biogenic	kg CO_2-Eq	3.31E+00	ND	ND	5.22E-04	3.40E-03	0	3.32E-04	-5.04E-03
GWP - fossil	kg CO_2-Eq	2.91E+02	ND	ND	2.58E+00	5.48E+00	0	6.96E-02	-1.32E+01
GWP - luluc	kg CO_2-Eq	5.31E-02	ND	ND	2.64E-04	1.90E-03	0	1.75E-05	-1.24E-02
ADP - fossil*	MJ, net calorific value	3.19E+02	ND	ND	1.82E+00	1.04E+01	0	1.00E+00	-3.68E+01
EP - fw	kg P-Eq	1.48E+03	ND	ND	3.36E+01	7.91E+01	0	1.64E+00	-1.90E+02
EP-marine	kg N-Eq	1.33E-01	ND	ND	8.32E-05	3.88E-04	0	1.20E-04	-8.14E-03
EP - terrestrial	mol N-Eq	2.73E-01	ND	ND	1.07E-02	9.88E-03	0	1.95E-04	-1.57E-02
ADP- elements*	kg Sb-Eq	2.79E+00	ND	ND	1.18E-01	1.08E-01	0	2.10E-03	-1.70E-01
ODP	kg CFC-11-Eq	4.29E-08	ND	ND	2.63E-10	1.41E-09	0	2.80E-11	-2.51E-09
POCP	kg NMVOC-Eq	1.42E-06	ND	ND	4.15E-09	5.52E-08	0	1.76E-09	-8.24E-08
WDP*	m^3 world eq. deprived	6.42E+00	ND	ND	1.43E-02	9.77E-02	0	2.08E-03	-2.14E+00
Acronyms	*GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-elements = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption*								

***Disclaimer:** The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

***General disclaimer:** The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. It is not recommended to use the results of modules A1-A3 without taking into account the results of module C.*

Additional mandatory and voluntary impact category indicators

Table 8: Additional mandatory and voluntary impact category indicators according to EN 15804 (EF 3.1)

Thermal insulation lightweight concrete block									
Indicator	**Unit**	**A1-A3**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**Module D**
Global warming potential (GWP-GHG)	kg CO_2eq	2.79E+02	ND	ND	8.24E+01	8.21E+00	0	2.58E+00	-1.32E+01
Particulate matter emissions (PM)	disease incidence	1.65E-05	ND	ND	5.97E-06	5.40E-07	0	1.19E-08	-7.25E-07
Ionising radiation: human health	kBq U235 eq	6.42E+00	ND	ND	1.43E-02	9.77E-02	0	2.08E-03	-2.14E+00
GWP-GHG: This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.									

Resource use indicators

Table 9: Resource use indicators for Thermal insulation lightweight concrete block

Thermal insulation lightweight concrete block									
Parameter	**Unit**	**A1-A3**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	6.17E+00	ND	ND	0	1.31E+00	0	0	-2.39E+00
PERM	MJ	2.61E+02	ND	ND	2.11E-01	1.65E-07	0	3.16E-02	-8.01E+00
PERT	MJ	2.67E+02	ND	ND	2.11E-01	1.31E+00	0	3.16E-02	-1.04E+01
PENRE	MJ	5.81E+02	ND	ND	0	7.91E+01	0	0	-8.29E+01
PENRM	MJ	8.97E+02	ND	ND	3.36E+01	0	0	1.64E+00	-1.07E+02
PENRT	MJ	1.48E+03	ND	ND	3.36E+01	7.91E+01	0	1.64E+00	-1.90E+02
SM	kg	0	ND	ND	0	0	0	0	0
RSF	MJ	0	ND	ND	0	0	0	0	0
NRSF	MJ	0	ND	ND	0	0	0	0	0
FW	m3	8.40E-01	ND	ND	2.15E-03	1.01E-02	0	-1.97E-02	-2.78E-01
Acronyms	*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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water*								

Waste indicators

Table 10: Waste indicators for Thermal insulation lightweight concrete block

Thermal insulation lightweight concrete block									
Indicator	**Unit**	**A1-A3**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	1.52E+00	ND	ND	3.00E-02	8.09E-02	0	1.94E-03	-6.11E-01
Non-hazardous waste disposed	kg	3.14E+01	ND	ND	2.20E-01	8.43E-01	0	2.32E+01	-9.28E+00
Radioactive waste disposed	kg	1.64E-03	ND	ND	3.52E-06	2.41E-05	0	5.00E-07	-5.12E-04

Output flow indicators

Table 11: Output flow indicators for Thermal insulation lightweight concrete block

Thermal insulation lightweight concrete block									
Indicator	**Unit**	**A1-A3**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0	ND	ND	0	0	0	0	0
Material for recycling	kg	1.84E-01	ND	ND	0	0	7.07E+02	0	0
Materials for energy recovery	kg	0	ND	ND	0	0	0	0	0
Exported energy, electricity	MJ	1.75E+01	ND	ND	0	0	0	0	0
Exported energy, thermal	MJ	3.20E+01	ND	ND	0	0	0	0	0

Load-bearing (acoustic) lightweight concrete blocks

Results of the environmental performance indicators

Table 12: Core environmental impact indicators according to EN 15804 (EF 3.1)

Load-beared (acoustic) lightweight concrete blocks									
Indicator	**Reference unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
AP	mol H^+-Eq	2.40E+00	ND	ND	4.29E-02	4.44E-02	0	1.46E-03	-1.31E-01
GWP-total	kg CO_2-Eq	3.89E+02	ND	ND	4.80E+00	9.67E+00	0	1.30E-01	-2.85E+01
GWP - biogenic	kg CO_2-Eq	4.74E+00	ND	ND	9.71E-04	5.98E-03	0	6.17E-04	-1.82E-03
GWP - fossil	kg CO_2-Eq	3.84E+02	ND	ND	4.80E+00	9.66E+00	0	1.29E-01	-2.85E+01
GWP - luluc	kg CO_2-Eq	9.10E-02	ND	ND	4.91E-04	3.35E-03	0	3.25E-05	-2.70E-02
ADP - fossil*	MJ, net calorific value	4.40E+02	ND	ND	3.39E+00	1.83E+01	0	1.87E+00	-7.83E+01
EP - fw	kg P-Eq	2.38E+03	ND	ND	6.24E+01	1.39E+02	0	3.06E+00	-4.18E+02
EP-marine	kg N-Eq	1.59E-01	ND	ND	1.55E-04	6.83E-04	0	2.23E-04	-1.89E-02
EP - terrestrial	mol N-Eq	3.39E-01	ND	ND	1.99E-02	1.74E-02	0	3.63E-04	-3.26E-02
ADP- elements*	kg Sb-Eq	3.49E+00	ND	ND	2.18E-01	1.90E-01	0	3.91E-03	-3.46E-01
ODP	kg CFC-11-Eq	7.62E-08	ND	ND	4.89E-10	2.48E-09	0	5.21E-11	-5.10E-09
POCP	kg NMVOC-Eq	2.08E-06	ND	ND	7.72E-09	9.74E-08	0	3.26E-09	-1.70E-07
WDP*	m^3 world eq. deprived	1.00E+01	ND	ND	2.66E-02	1.72E-01	0	3.86E-03	-5.00E+00
Acronyms	*GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-elements = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption*								

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Additional mandatory and voluntary impact category indicators

Table 13: Additional mandatory and voluntary impact category indicators according to EN 15804 (EF 3.1)

Load-beared (acoustic) lightweight concrete blocks									
Indicator	**Unit**	**A1-A3**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**Module D**
Global warming potential (GWP-GHG)	kg CO_2eq	3.43E+02	ND	ND	7.89E+01	2.89E+01	0	4.80E+00	-2.85E+01
Particulate matter emissions (PM)	disease incidence	1.83E-05	ND	ND	1.11E-05	9.53E-07	0	2.21E-08	-1.40E-06
Ionising radiation: human health	kBq U235 eq	1.00E+01	ND	ND	2.66E-02	1.72E-01	0	3.86E-03	-5.00E+00
GWP-GHG: This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.									

Resource use indicators

Table 14: Resource use indicators for load-bearing (acoustic) lightweight concrete block

Load-beared (acoustic) lightweight concrete blocks									
Parameter	**Unit**	**A1-A3**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	9.15E+00	ND	ND	0	2.32E+00	0	0	-5.99E+00
PERM	MJ	5.75E+02	ND	ND	3.93E-01	0	0	5.88E-02	-1.50E+01
PERT	MJ	5.84E+02	ND	ND	3.93E-01	2.32E+00	0	5.88E-02	-2.10E+01
PENRE	MJ	7.58E+02	ND	ND	0	1.39E+02	0	0	-2.07E+02
PENRM	MJ	1.62E+03	ND	ND	6.24E+01	0	0	3.06E+00	-2.11E+02
PENRT	MJ	2.38E+03	ND	ND	6.24E+01	1.39E+02	0	3.06E+00	-4.18E+02
SM	kg	0	ND	ND	0	0	0	0	0
RSF	MJ	0	ND	ND	0	0	0	0	0
NRSF	MJ	0	ND	ND	0	0	0	0	0
FW	m^3	1.90E+00	ND	ND	4.00E-03	1.78E-02	0	-3.65E-02	-5.37E-01
Acronyms	*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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water*								

Waste indicators

Table 15: Waste indicators for load-bearing (acoustic) lightweight concrete blocks

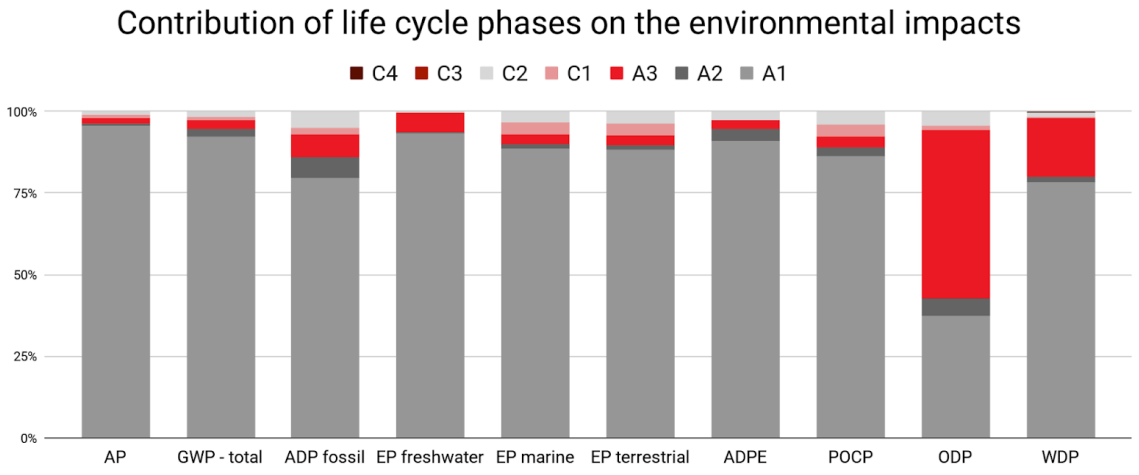
Load-beared (acoustic) lightweight concrete blocks									
Indicator	**Unit**	**A1-A3**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	2.46E+00	ND	ND	5.57E-02	1.43E-01	0	3.60E-03	-1.25E+00
Non-hazardous waste disposed	kg	5.69E+01	ND	ND	4.10E-01	1.49E+00	0	4.31E+01	-2.10E+01
Radioactive waste disposed	kg	2.56E-03	ND	ND	6.53E-06	4.25E-05	0	9.29E-07	-1.19E-03

Output flow indicators

Table 16: Output flow indicators for load-bearing (acoustic) lightweight concrete blocks

Load-bearing (acoustic) lightweight concrete blocks									
Indicator	**Unit**	**A1-A3**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0	ND	ND	0	0	0	0	0
Material for recycling	kg	4.41E-01	ND	ND	0	0	1.31E+03	0	0
Materials for energy recovery	kg	0	ND	ND	0	0	0	0	0
Exported energy, electricity	MJ	4.39E+01	ND	ND	0	0	0	0	0
Exported energy, thermal	MJ	7.93E+01	ND	ND	0	0	0	0	0

LCA Interpretation



Graph 1: Contribution of life cycle phases of Lightweight concrete blocks to the environmental impacts

Based on normalised and weighted results according to the EF ver. 3.1, the three most relevant impact categories (hotspots) are Climate change, Particulate matter emissions (PM), and Acidification.

The production phase (modules A1 - A3) has the highest environmental impacts in all impact categories through the life cycle of Lightweight concrete blocks, mainly due to emissions from cement production. Another important phase of the life cycle is module A3 - manufacturing.

Environmental performance indicators

Acidification (AP)
Acidification is the process of increasing the acidity of soils, air, or water caused by an elevated concentration of hydrogen ions. An indicator of the impact category of acidification is accumulated exceedance (AE). The result is expressed in mol H^+ eq.

Climate change (GWP)
Climate change is divided into three parts: biogenic, fossil, land use and land use change. An indicator called global warming potential (GWP100) is used to measure the amount of greenhouse gases contributing to global warming. The results are quantified in kilograms of CO_2 eq.

Ozone depletion (ODP)
Ozone layer depletion is the result of emissions of ozone-depleting substances, such as long-lived chlorine and bromine-containing gases (e.g., CFCs, HCFCs, Halons). It is quantified in kg CFC-11 eq., with the ozone depletion potential as its indicator.

Water use (WDP)
Water deprivation potential quantifies the potential of water deprivation to humans or ecosystems. It is quantified in m^3 world eq. and helps evaluate the risks associated with water scarcity.

Photochemical oxidant formation (POCP)
The impact category photochemical oxidation formation aggregates substances that contribute to the formation of tropospheric ozone. Category indicator is tropospheric ozone concentration increase expressed in kg NMVOC eq.

Resources use, minerals and metals (ADP)
Resource scarcity and limitations for current and future generations include depletion of abiotic resources - elements (ADPe), quantified in kg Sb eq. and depletion of abiotic resources - fossil fuels (ADPf), quantified in MJ.

Eutrophication (EP)
Eutrophication enriches the environment with nutrients, impacting land, water, and seas leading to excess plankton and algae growth, harming the water quality. It is categorised into terrestrial (accumulated exceedance expressed in mol N eq.), freshwater (nutrient fraction reaching freshwater end expressed in kg P eq.), and marine impacts (nutrient fraction reaching marine end expressed in kg N eq.

Additional environmental information

Given the declaration of the results of environmental impact indicators for average products for thermal insulation and load-bearing (acoustic) lightweight concrete blocks, deviations for the most demanding scenarios were defined as part of the sensitivity analysis.

Thermal insulation lightweight concrete block

For the thermal insulation concrete group, the representative with the highest bulk density and amount of binder was assessed. For all environmental indicators (core and additional), there is no increase in impact of more than 20 %. Maximum variations for the core indicators are shown in Table 17. In the case of lightweight concrete block representatives with a lower bulk density, there may be a reduction in impacts compared to the declared results for average concrete block, but this scenario was not assessed.

Table 17: Core environmental impact indicators according to EN 15804 – Maximum variations of results for Thermal insulation lightweight concrete blocks

Thermal insulation lightweight concrete block - variations of results								
Indicator	**Reference unit**	**A1-A3**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**
AP	mol H^+-Eq	10.5%	ND	ND	12.0%	11.6%	0.0%	12.0%
GWP-total	kg CO_2-Eq	9.8%	ND	ND	12.0%	11.6%	0.0%	12.0%
GWP - biogenic	kg CO_2-Eq	16.1%	ND	ND	12.1%	11.5%	0.0%	12.0%
GWP - fossil	kg CO_2-Eq	9.7%	ND	ND	12.0%	11.6%	0.0%	12.0%
GWP - luluc	kg CO_2-Eq	12.4%	ND	ND	12.1%	11.6%	0.0%	12.0%
ADP - fossil*	MJ, net calorific value	8.3%	ND	ND	12.0%	11.6%	0.0%	12.0%
EP - fw	kg P-Eq	1.1%	ND	ND	12.0%	11.6%	0.0%	11.7%
EP-marine	kg N-Eq	5.3%	ND	ND	12.0%	11.6%	0.0%	11.9%
EP - terrestrial	mol N-Eq	6.0%	ND	ND	12.0%	11.6%	0.0%	12.0%
ADP- elements*	kg Sb-Eq	8.4%	ND	ND	11.8%	11.7%	0.0%	12.0%
ODP	kg CFC-11-Eq	10.4%	ND	ND	12.0%	11.7%	0.0%	12.0%
POCP	kg NMVOC-Eq	5.3%	ND	ND	12.0%	11.6%	0.0%	12.1%
WDP*	m^3 world eq. deprived	17.2%	ND	ND	12.0%	11.6%	0.0%	12.0%
Acronyms	*GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-elements = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption*							

***Disclaimer:** The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Load-bearing, acoustic lightweight concrete block

For the load-bearing, acoustic concrete group, the representative with the highest bulk density and amount of binder was assessed and, in selected impact categories, adjusted according to the representative with the highest content of Liapor® lightweight aggregate. For all environmental indicators (core and additional), there is no increase in impacts of more than 33 % except in the categories of acidification and particulate matter emissions, where there is an increase of up to 54 %. Maximum variations for the core environmental impact indicators are shown in Table 18.

Increasing the amount of Liapor® lightweight aggregate increases the impacts in the categories of acidification, freshwater eutrophication and particulate matter emissions and reduces the impacts in all other categories. Therefore, these three impact categories in modules A1-A3 were increased according to the representative of load-bearing lightweight concrete block with the highest content of lightweight aggregate for the calculation of the deviation.

In the case of concrete block representatives with a lower bulk density, there may be a reduction in impacts compared to the declared average results, but this scenario was not assessed.

Table 18: Core environmental impact indicators according to EN 15804 – Maximum variations of results for Load-bearing (acoustic) lightweight concrete blocks

Load-beared (acoustic) lightweight concrete blocks								
Indicator	**Reference unit**	**A1-A3**	**A4-A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**
AP	mol H^+-Eq	54.3%	ND	ND	15.3%	21.0%	0.,0%	15.3%
GWP-total	kg CO_2-Eq	19.5%	ND	ND	15.3%	21.0%	0.0%	15.3%
GWP - biogenic	kg CO_2-Eq	32.2%	ND	ND	15.3%	21.0%	0.0%	15.3%
GWP - fossil	kg CO_2-Eq	19.3%	ND	ND	15.3%	21.0%	0.0%	15.3%
GWP - luluc	kg CO_2-Eq	23.9%	ND	ND	15.3%	21.0%	0.0%	15.3%
ADP - fossil*	MJ, net calorific value	18.1%	ND	ND	15.3%	21.0%	0.0%	15.3%
EP - fw	kg P-Eq	25.4%	ND	ND	15.3%	21.0%	0.0%	15.3%
EP-marine	kg N-Eq	6.6%	ND	ND	15.3%	21.0%	0.0%	15.3%
EP - terrestrial	mol N-Eq	9.0%	ND	ND	15.3%	21.0%	0.0%	15.3%
ADP- elements*	kg Sb-Eq	18.8%	ND	ND	15.3%	21.0%	0.0%	15.3%
ODP	kg CFC-11-Eq	18.5%	ND	ND	15.3%	21.0%	0.0%	15.3%
POCP	kg NMVOC-Eq	9.2%	ND	ND	15.3%	21.0%	0.0%	15.3%
WDP*	m^3 world eq. deprived	21.9%	ND	ND	15.3%	21.0%	0.0%	15.3%
Acronyms	*GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-elements = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption*							

***Disclaimer:** The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

References

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