bauroc BLOCK PRODUCTS

Environmental Product Declaration

EN 15804+A2 & ISO 14025 / ISO 21930

bauroc

SUSTAINABLE BUILDING SINCE 2001

GENERAL INFORMATION

MANUFACTURER INFORMATION

Manufacturer	Bauroc AS
Address	Andja, Rakvere vald, 44209 Lääne-Virumaa, Estonia
Contact details	toomas.nilson@bauroc.eu
Website	www.bauroc.ee

PRODUCT IDENTIFICATION

Product name	Autoclaved aerated concrete blocks – ECOTERM+, UNIVERSAL, ECOTERM, ECOLIGHT, ROCLITE, CLASSIC, ELEMENT, PLADE, HARD, ACOUSTIC
Additional label(s)	CE
Place(s) of production	Estonia, Andja

EPD INFORMATION

EPDs of construction products 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 Building Information Foundation RTS sr Malminkatu 16 A, 00100 Helsinki, Finland http://cer.rts.fi
EPD standards	This EPD is in accordance with EN 15804+A2 and ISO 14025 standards
Product category rules	CEN standard 15804+A2 serves as the core PCR, RTS PCR (English version, 26.8.2020)
EPD author	Anni Oviir, Anette Iital Rangi Maja OÜ, www.lcasupport.com
EPD verification	Independent verification of this EPD and data, according to ISO 14025: Internal certification ☐ External verification ☑
EPD verifier	Silvia Vilčeková, Silcert, s.r.o. silcertsro@gmail.com
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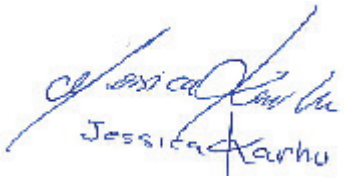
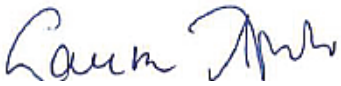
Jessica Karhu
RTS EPD Committee secretary



Laura Apilo
Managing Director



PRODUCT INFORMATION

PRODUCT DESCRIPTION

Bauroc autoclaved aerated concrete (AAC) products are made purely from natural raw minerals, practically inexhaustible in nature - sand, cement, lime, gypsum and water – using an aerating agent, the aluminium. Mixed slurry formulation is poured into the casting moulds. After expansion of the mixture in pre-curing room during several hours, the aerated concrete blocks are cut and then they are put into the autoclave in groups for steam curing.

Bauroc AAC products are produced with various densities from 300 kg/m^3 up to 700 kg/m^3. Autoclaved aerated concrete is extremely strong and durable despite its lightweight. AAC's solidity comes from the calcium silicate that encloses its millions of air pores and from the process of curing in a pressurised steam chamber, an autoclave.

PRODUCT APPLICATION

Bauroc products are used in single and multi-floor houses, social and touristic facilities as well as commercial and industrial buildings, providing economy, quality, comfort and speed in constructions. The products are used as interior or exterior wall material in all kinds of framed and/or bearing-wall construction. Products are also used as permanent infill in ribbed floor-deck construction.

Having a porous structure, bauroc products provide a high level of thermal insulation. It is an ideal material that offers significant savings in the initial outlay and running costs of heating or cooling buildings as well as opportunity for exploiting other potential benefits.

All Bauroc products have excellent resistance to fire. Bauroc AAC is classified as non-combustible and has a reaction to fire of Class A1. A 150 mm thick bauroc block wall is fire resistant up to 4 hours in non-loadbearing situations and 2 hours in loadbearing situations. AAC inhibits heat transfer through a wall several times better than normal concrete.

PRODUCT STANDARDS

EN 771-4:2011+A1:2015 Specification for masonry units. Autoclaved aerated concrete masonry units;

PHYSICAL PROPERTIES OF THE PRODUCT

Product properties can be found on the manufacturer website at

https://bauroc.eu/products/

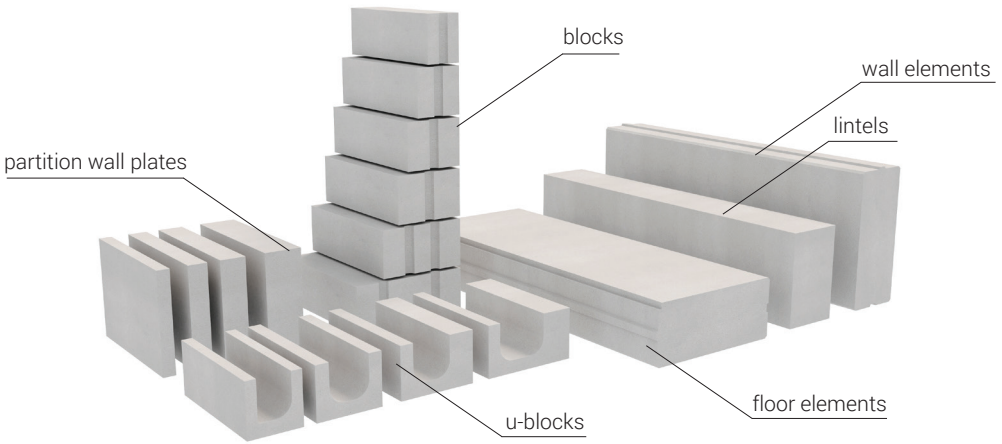
ADDITIONAL TECHNICAL INFORMATION

Further information can be found at

https://bauroc.ee/

TECHNICAL SPECIFICATIONS

Product	Thickness (mm)	Density (kg/m^3)	Thermal conductivity $\lambda_{10,dry}$(W/mK)
ECOTERM+	300, 375, 400, 425, 500	300	0,072
UNIVERSAL	200/300, 200/250	375	0,09
ECOTERM	375	375	0,09
ECOLIGHT	100, 150, 200, 250	375	0,09
ROCLITE	100, 150, 200, 250, 300	400	0,096
CLASSIC	100, 150, 200, 250, 300	425	0,1
ELEMENT	50, 75, 100, 150	475	0,11
PLADE	50, 75, 100, 125, 150	535	0,13
HARD	150, 200, 250, 300	535	0,13
ACOUSTIC	100, 150, 200, 250	575	0,14



PRODUCT RAW MATERIAL COMPOSITION

Materials	Amount (%)	Usability			Origin
		Renewable	Non-renew-able	Recycled	
Cement, powder	19-27%		x		Estonia
Lime, powder	2-6%		x		Estonia
Fly Ash, powder	1-15%		x		Estonia
Sand	27-33%		x		Estonia
Gypsum stone	2-4%		x		EU
Additives	<0.05%		x		EU and non-EU
Water	5-7%		x		Estonia
Water, loss of moisture	25-35%		x		Estonia

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	0	-
Minerals	65	EU
Water	35	Estonia
Fossil materials	0	-
Bio-based materials	0	-

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)

Key ingredient for manufacturing bauroc AAC products is silica rich sand. Sand is mixed with gypsum and water and grinds finally in the ball mill converting it into sand slurry. Sand slurry is pumped into a separate container/tank. Similarly, lime powder and cement are transported into individual containers using screw conveyors. Once the required amount of each ingredient is reached, control system releases all ingredients into mixing drum. A small amount of aluminium suspension is added separately. Once the mixture has settled, it is ready to be poured into moulds using the dosing unit.

Before casting, moulds are coated with a thin layer of oil. This is done in order to ensure that green-cake does not stick to moulds.

While slurry is mixed and poured into oiled moulds, aluminium reacts with Calcium Hydroxide and water to form Hydrogen. Millions of tiny Hydrogen bubbles are released due to this reaction. This leads to the formation of tiny unconnected cells causing the slurry mix to expand. This process is called rising. These cells are the reason behind the lightweight and insulating properties of bauroc blocks. Once the rising process is over, green-cake is allowed to settle and cure for some time. This ensures the cutting strength required for wire cutting.

Usually rising and the pre-curing process takes around 4-6 hours. At end of the pre-curing process, green-cake will achieve cutting strength and will be sent by a crane to cutting line using flat-cake technology and two cutting machines.

During cutting process, the top and side layers will be removed of crust in the green stage. This crust is recycled and afterwards reused in production process. After cutting, the blocks are transported into the autoclave (a large pressure vessel), where the curing process is completed.

Autoclaving is required to achieve the desired structural properties and dimensional stability. The process takes about 10 to 12 hours under a high pressure and a temperature.

The final manufacturing process stage is sorting and packaging blocks on wooden pallets and covering with plastic wrap. Eventually, the elements are moved out and transported to the construction site.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site cover direct exhaust emissions of fuel, environmental impacts of fuel production, as well as related infrastructure emissions. Optional A5 module is not declared.

PRODUCT USE AND MAINTENANCE (B1-B7)

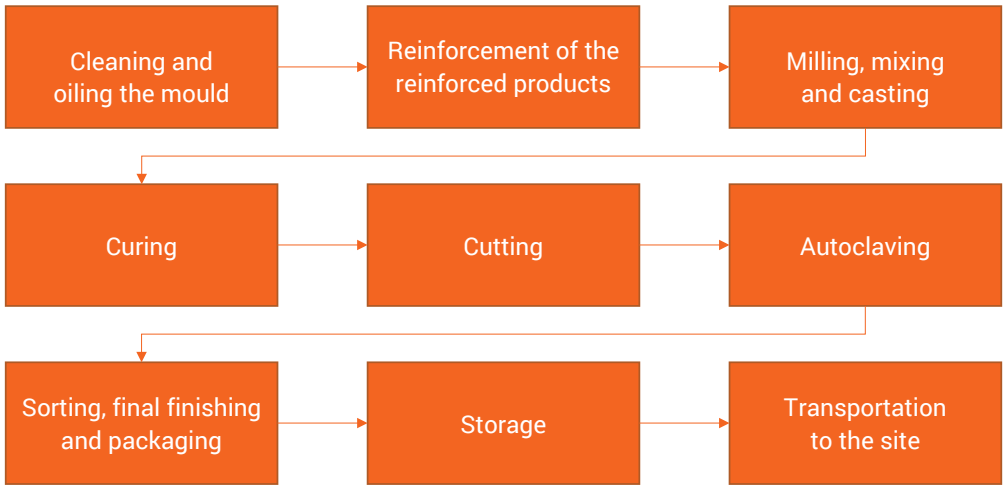
This EPD does not cover use phase. Air, soil and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

At the end-of-life, in the demolition phase 100% of the waste is assumed to be collected as separate construction waste (C1). All of end-of-life product is assumed to be sent to the closest facilities (C2).

92% of concrete is recycled (C3) and the remaining is sent to local landfill for disposal (C4). Due to the recycling potential of concrete, the end-of-life product is converted into recycled raw materials (D).

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

LIFE-CYCLE ASSESSMENT INFORMATION

Period for data	Manufacturer data for the calendar year 2020 is used

DECLARED AND FUNCTIONAL UNIT

Declared unit	1 m^3 (1 cubic meter)
Mass per declared unit	338 / 450 / 555 kg/m^3
Functional unit	-

Products with the average density of **338 kg/m^3**	• ECOTERM+ (300 kg/m^3) • UNIVERSAL (375 kg/m^3 • ECOTERM (375 kg/m^3 • ECOLIGHT (375 kg/m^3) • ROCLITE (400 kg/m^3)
Products with the average density of **450 kg/m^3**	• CLASSIC (425 kg/m^3) • ELEMENT (475 kg/m^3)
Products with the average density of **555 kg/m^3**	• PLADE (535 kg/m^3) • HARD (535 kg/m^3) • ACOUSTIC (575 kg/m^3)

BIOGENIC CARBON CONTENT

The product itself does not contain biogenic carbon. Packaging contains biogenic carbon.

Biogenic carbon content in product, kg C	-
Biogenic carbon content in packaging, kg C	12,7

SYSTEM BOUNDARY

This EPD covers cradle to gate with modules C1-C4 and module D; A1 (Raw material supply), A2 (Transport) and A3 (Manufacturing), A4 (Transport) 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	MND	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x	x	x
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 RTS 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 which data are available for are included in the calculation. There is no neglected unit process more than 1% of total mass and energy flows. The total neglected input and output flows do also not exceed 5% of energy usage or mass. The life cycle analysis includes all industrial processes from raw material acquisition to production, distribution, and end-of-life stages.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy, and water use related to company management and sales activities are excluded.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

The allocation is made in accordance with the provisions of EN 15804. Allocation is based on annual production rate. Heat, electricity and other energy use as well as waste in production are calculated as a weight average per produced cubic meter of all products using yearly production data and rate for 2020.

Carbonation is not taken into account in the calculations. Carbonation is a natural process occurring when carbon dioxide is emitted during cement production is rebound to the concrete during use and end of life stages of a building.

This LCA study is conducted in accordance with all methodological considerations, such as performance, system boundaries, data quality, allocation procedures, and decision rules to evaluate inputs and outputs. All estimations and assumptions are given below:

Module A1: Raw material composition is an average value calculated using total annual material consumption for the product by mass within the studied year 2020.

Module A3: Electricity used during manufacturing is hydroelectricity from Finland.

Module A4: Transportation from the manufacturing plant to the building site has been calculated using a most likely scenario, an export to Latvia. The scenario is estimating the distance to be 364 km with a truck and the fill rate to be 75%. The transportation doesn't cause losses as products are packaged properly. Bulk density varies depending on product type and thickness and is calculated as an approximate.

Module C1: Energy consumption of demolition process is on the average 10 kWh/m2 (Bozdağ, Ö & Seçer, M. 2007). An average mass of a concrete building is about 1000 kg/m^2. Therefore, energy consumption demolition is 10 kWh/ 1000 kg=0,01 kWh/kg.

Module C2: It is estimated that there is no mass loss during the use of the product, therefore the end-of-life product is assumed to have the same weight with the declared product. All of the end-of-life product is assumed to be sent to the closest facilities such as recycling and landfill. Transportation distance to the closest disposal area is estimated as 50 km and the transportation method is assumed as lorry, which is most common.

Module A2 & C2: Vehicle capacity utilization volume factor is assumed to be 1 which means full load. In reality, it may vary but as role of transportation emission in total results is small and so the variety in load assumed to be negligible. Empty returns are not taken into account as it is assumed that return trip is used by transportation company to serve needs of other clients.

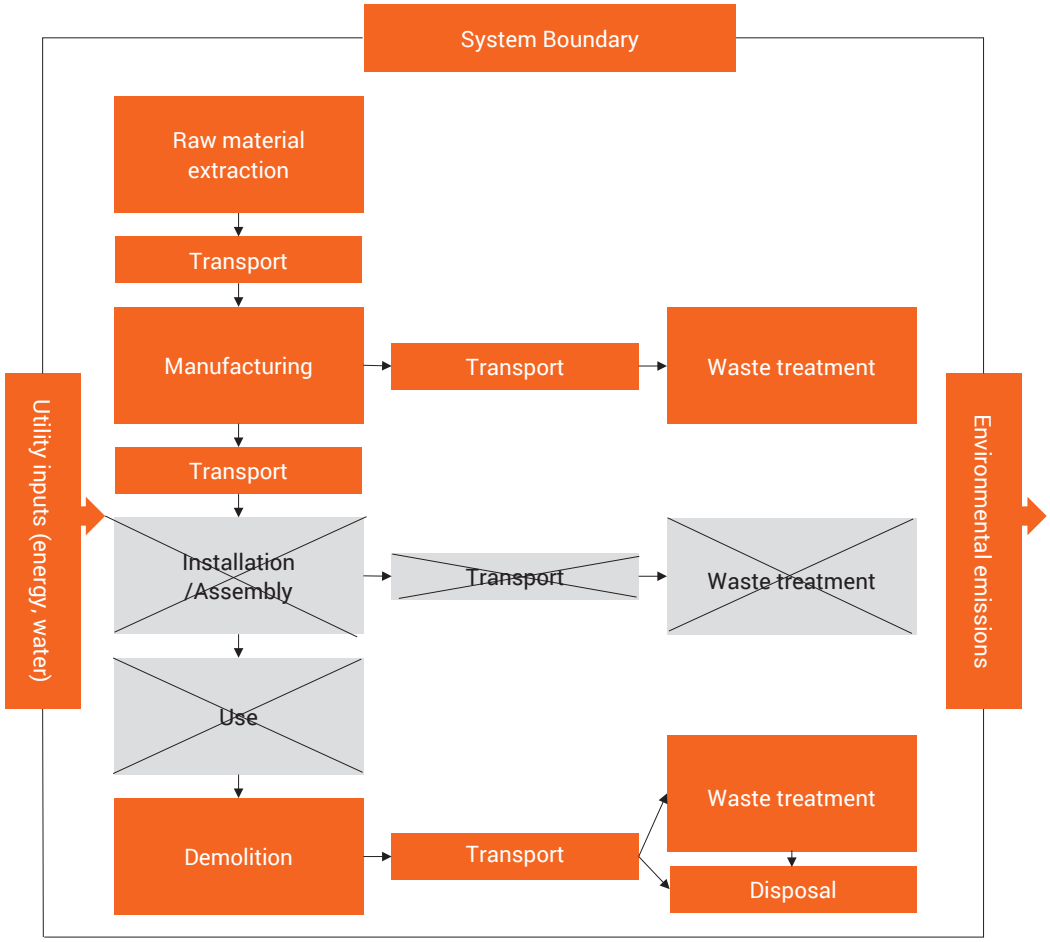
Module C3: It is assumed that 92% of the concrete and 100% of steel waste is recycled. This assumption is based on information from a study by T.Ideon and M. Osjamets (2010) procured by the Estonian Ministry of Environment.

Module C4: The remaining waste materials are assumed to be send to the landfill.

AVERAGES AND VARIABILITY

The autoclaved aerated concrete blocks have been grouped into 3 groups. The GWP results of the products belonging to one group do not differ more than 10%. The LCA results are calculated as an average product for each group.

LIFE CYCLE STAGES DIAGRAM



ENVIRONMENTAL IMPACT DATA

NOTE: ENVIRONMENTAL IMPACTS - EN 15804+A1, CML / ISO 21930 ARE PRESENTED IN ANNEX.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1-A3			A4			A5	B1-B7
		338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³		
Climate change – total	kg CO_2e	1,21E2	1,52E2	1,81E2	8,5E0	1,13E1	1,38E1	MND	MND
Climate change – fossil	kg CO_2e	1,22E2	1,53E2	1,82E2	8,57E0	1,14E1	1,4E1	MND	MND
Climate change – biogenic	kg CO_2e	−1,7E0	−1,3E0	−9,28E−1	6,23E−3	8,25E−3	1,01E−2	MND	MND
Climate change – LULUC	kg CO_2e	4,25E−1	5,78E−1	7,11E−1	2,58E−3	3,42E−3	4,2E−3	MND	MND
Ozone depletion	kg CFC11e	6,83E−6	8,83E−6	1,07E−5	2,02E−6	2,67E−6	3,28E−6	MND	MND
Acidification	mol H+e	2,82E−1	3,5E−1	4,11E−1	3,6E−2	4,77E−2	5,87E−2	MND	MND
Eutrophication, aquatic freshwater[2)]	kg Pe	1,31E−3	1,6E−3	1,87E−3	6,98E−5	9,25E−5	1,14E−4	MND	MND
Eutrophication, aquatic marine	kg Ne	7,63E−2	9,51E−2	1,12E−1	1,09E−2	1,44E−2	1,77E−2	MND	MND
Eutrophication, terrestrial	mol Ne	8,89E−1	1,11E0	1,3E0	1,2E−1	1,59E−1	1,95E−1	MND	MND
Photochemical ozone formation	kg NMVOCe	2,34E−1	2,91E−1	3,42E−1	3,85E−2	5,11E−2	6,28E−2	MND	MND
Abiotic depletion, minerals & metals	kg Sbe	1,03E−3	1,36E−3	1,48E−3	1,46E−4	1,94E−4	2,38E−4	MND	MND
Abiotic depletion of fossil resources	MJ	8,01E2	1,03E3	1,23E3	1,33E2	1,77E2	2,17E2	MND	MND
Water use[1)]	m^3e depr.	1,51E1	1,99E1	2,2E1	4,96E−1	6,58E−1	8,08E−1	MND	MND

Impact category	Unit	C1			C2			C3			C4			D		
		338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³
Climate change – total	kg CO_2e	1,11E0	1,48E0	1,83E0	1,54E0	2,05E0	2,52E0	1,24E0	1,66E0	2,04E0	1,42E−1	1,9E−1	2,34E−1	−2,59E0	−3,46E0	−4,26E0
Climate change – fossil	kg CO_2e	1,11E0	1,48E0	1,83E0	1,53E0	2,04E0	2,52E0	1,24E0	1,66E0	2,04E0	1,42E−1	1,9E−1	2,34E−1	−2,59E0	−3,45E0	−4,26E0
Climate change – biogenic	kg CO_2e	3,1E−4	4,13E−4	5,09E−4	1,11E−3	1,49E−3	1,83E−3	3,46E−4	4,61E−4	5,68E−4	2,82E−4	3,76E−4	4,64E−4	−4,66E−3	−6,21E−3	−7,66E−3
Climate change – LULUC	kg CO_2e	9,41E−5	1,25E−4	1,55E−4	4,62E−4	6,15E−4	7,59E−4	1,05E−4	1,4E−4	1,73E−4	4,22E−5	5,63E−5	6,94E−5	−9,67E−4	−1,29E−3	−1,59E−3
Ozone depletion	kg CFC11e	2,41E−7	3,2E−7	3,95E−7	3,61E−7	4,81E−7	5,93E−7	2,68E−7	3,58E−7	4,41E−7	5,86E−8	7,81E−8	9,63E−8	−8,78E−7	−1,17E−6	−1,44E−6
Acidification	mol H+e	1,17E−2	1,55E−2	1,91E−2	6,44E−3	8,59E−3	1,06E−2	1,3E−2	1,73E−2	2,14E−2	1,35E−3	1,8E−3	2,22E−3	−2,14E−2	−2,85E−2	−3,52E−2
Eutrophication, aquatic freshwater[2)]	kg Pe	4,51E−6	6E−6	7,4E−6	1,25E−5	1,66E−5	2,05E−5	5,02E−6	6,7E−6	8,26E−6	1,72E−6	2,29E−6	2,82E−6	−3,37E−5	−4,49E−5	−5,54E−5
Eutrophication, aquatic marine	kg Ne	5,15E−3	6,85E−3	8,45E−3	1,94E−3	2,59E−3	3,19E−3	5,74E−3	7,65E−3	9,44E−3	4,65E−4	6,2E−4	7,64E−4	−7,44E−3	−9,92E−3	−1,22E−2
Eutrophication, terrestrial	mol Ne	5,64E−2	7,52E−2	9,27E−2	2,14E−2	2,86E−2	3,53E−2	6,29E−2	8,39E−2	1,04E−1	5,12E−3	6,82E−3	8,42E−3	−8,2E−2	−1,09E−1	−1,35E−1
Photochemical ozone formation	kg NMVOCe	1,55E−2	2,07E−2	2,55E−2	6,89E−3	9,19E−3	1,13E−2	1,73E−2	2,31E−2	2,85E−2	1,49E−3	1,98E−3	2,44E−3	−2,36E−2	−3,15E−2	−3,89E−2
Abiotic depletion, minerals & metals	kg Sbe	1,7E−6	2,27E−6	2,79E−6	2,62E−5	3,49E−5	4,3E−5	1,9E−6	2,53E−6	3,12E−6	1,3E−6	1,73E−6	2,14E−6	−3,67E−5	−4,89E−5	−6,03E−5
Abiotic depletion of fossil resources	MJ	1,53E1	2,04E1	2,52E1	2,39E1	3,18E1	3,92E1	1,71E1	2,28E1	2,81E1	3,97E0	5,3E0	6,54E0	−6,02E1	−8,03E1	−9,9E1
Water use[1)]	m^3e depr.	2,86E−2	3,81E−2	4,7E−2	8,87E−2	1,18E−1	1,46E−1	3,19E−2	4,25E−2	5,25E−2	1,84E−1	2,45E−1	3,02E−1	−2,18E0	−2,91E0	−3,59E0

EN 15804+A2 disclaimer for Abiotic depletion and Water use indicators and all 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.

USE OF NATURAL RESOURCES

Impact category	Unit	A1-A3			A4			A5	B1-B7
		338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³		
Renewable PER used as energy4)	MJ	9,42E1	1,15E2	1,33E2	1,68E0	2,23E0	2,74E0	MND	MND
Renewable PER used as materials	MJ	7,36E1	7,36E1	7,36E1	0.00E+00	0.00E+00	0.00E+00	MND	MND
Total use of renewable PER	MJ	1,68E2	1,88E2	2,07E2	1,68E0	2,23E0	2,74E0	MND	MND
Non-renew. PER used as energy	MJ	7,8E2	1,01E3	1,21E3	1,33E2	1,77E2	2,17E2	MND	MND
Non-renew. PER used as materials	MJ	2,1E1	2,1E1	2,1E1	0.00E+00	0.00E+00	0.00E+00	MND	MND
Total use of non-renewable PER	MJ	8,01E2	1,03E3	1,23E3	1,33E2	1,77E2	2,17E2	MND	MND
Use of secondary materials	kg	1,42E−1	1,72E−1	2,02E−1	0.00E+00	0.00E+00	0.00E+00	MND	MND
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND
Use of non-renew. secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND
Use of net fresh water	m³	1,17E0	1,54E0	1,72E0	2,78E−2	3,68E−2	4,52E−2	MND	MND

Impact category	Unit	C1			C2			C3			C4			D		
		338 kg/ m^3	450 kg/ m^3	555 kg/ m^3	338 kg/ m^3	450 kg/ m^3	555 kg/ m^3	338 kg/ m^3	450 kg/ m^3	555 kg/ m^3	338 kg/ m^3	450 kg/ m^3	555 kg/ m^3	338 kg/ m3	450 kg/ m^3	555 kg/m^3
Renewable PER used as energy4)	MJ	8,29E−2	1,1E−1	1,36E−1	3E−1	4E−1	4,94E−1	9,25E−2	1,23E−1	1,52E−1	3,21E−2	4,29E−2	5,28E−2	−7,5E−1	−1E0	−1,23E0
Renewable PER used as materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable PER	MJ	8,29E−2	1,1E−1	1,36E−1	3E−1	4E−1	4,94E−1	9,25E−2	1,23E−1	1,52E−1	3,21E−2	4,29E−2	5,28E−2	−7,5E−1	−1E0	−1,23E0
Non-renew. PER used as energy	MJ	1,53E1	2,04E1	2,52E1	2,39E1	3,18E1	3,92E1	1,71E1	2,28E1	2,81E1	3,97E0	5,3E0	6,54E0	−6,02E1	−8,03E1	−9,9E1
Non-renew. PER used as materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable PER	MJ	1,53E1	2,04E1	2,52E1	2,39E1	3,18E1	3,92E1	1,71E1	2,28E1	2,81E1	3,97E0	5,3E0	6,54E0	−6,02E1	−8,03E1	−9,9E1
Use of secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renew. secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m^3	1,35E−3	1,8E−3	2,22E−3	4,97E−3	6,62E−3	8,17E−3	1,51E−3	2,01E−3	2,48E−3	4,35E−3	5,8E−3	7,15E−3	−5,31E−2	−7,08E−2	−8,74E−2

PER abbreviation stands for primary energy resources

END OF LIFE – WASTE

Impact category	Unit	A1-A3			A4			A5	B1-B7
		338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³		
Hazardous waste	Kg	1,77E0	2,17E0	2,53E0	1,3E−1	1,72E−1	2,11E−1	MND	MND
Non-hazardous waste	Kg	7,77E1	8,85E1	1,89E2	1,43E1	1,9E1	2,34E1	MND	MND
Radioactive waste	Kg	2,48E−3	3,09E−3	3,69E−3	9,16E−4	1,21E−3	1,49E−3	MND	MND

Impact category	Unit	C1			C2			C3			C4			D		
		338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³
Hazardous waste	Kg	1,65E−2	2,2E−2	2,71E−2	2,32E−2	3,09E−2	3,81E−2	0.00E+00	0.00E+00	0.00E+00	3,71E−3	4,94E−3	6,1E−3	−6,55E−2	−8,73E−2	−1,08E−1
Non-hazardous waste	Kg	1,76E−1	2,35E−1	2,9E−1	2,56E0	3,42E0	4,22E0	0.00E+00	0.00E+00	0.00E+00	2,7E1	3,6E1	4,44E1	−3,1E2	−4,14E2	−5,1E2
Radioactive waste	Kg	1,07E−4	1,43E−4	1,76E−4	1,64E−4	2,18E−4	2,69E−4	0.00E+00	0.00E+00	0.00E+00	2,63E−5	3,51E−5	4,32E−5	−3,99E−4	−5,33E−4	−6,57E−4

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1-A3			A4	A5	B1-B7	C1	C2	C3			C4	D
		338 kg/m3	450 kg/m3	555 kg/m3						338 kg/m³	450 kg/m³	555 kg/m³		
Components for reuse	Kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	Kg	3,09E0	3,09E0	3,09E0	0.00E+00	MND	MND	0.00E+00	0.00E+00	3,11E2	4,14E2	5,11E2	0.00E+00	0.00E+00
Materials for energy recovery	Kg	3,44E0	3,44E0	3,44E0	0.00E+00	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

KEY INFORMATION TABLE (RTS) – KEY INFORMATION PER KG OF PRODUCT

Impact category	Unit	A1-A3			A4			A5	B1-B7
		338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³		
Climate change – total	kg CO_2e	3,58E−1	3,38E−1	3,27E−1	2,54E−2	2,53E−2	2,52E−2	MND	MND
Abiotic depletion, minerals & metals	kg Sbe	3,05E−6	3,01E−6	2,68E−6	4,33E−7	4,31E−7	4,3E−7	MND	MND
Abiotic depletion of fossil resources	MJ	2,37E0	2,28E0	2,22E0	3,95E−1	3,93E−1	3,92E−1	MND	MND
Water use	m³e depr.	4,48E−2	4,43E−2	3,96E−2	1,47E−3	1,46E−3	1,46E−3	MND	MND
Use of secondary materials	kg	4,19E−4	3,83E−4	3,63E−4	0.00E+00	0.00E+00	0.00E+00	MND	MND
Biogenic carbon content in product	kg C	0.00E+00	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A
Biogenic carbon content in packaging	kg C	0.00E+00	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A	N/A

Impact category	Unit	C1			C2			C3			C4			D		
		338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³
Impact category	Unit	3,3E−3	3,3E−3	3,3E−3	4,54E−3	4,55E−3	4,55E−3	3,68E−3	3,68E−3	3,68E−3	4,22E−4	4,22E−4	4,22E−4	−7,67E−3	−7,68E−3	−7,68E−3
Climate change – total	kg CO_2e	5,03E−9	5,03E−9	5,03E−9	7,74E−8	7,75E−8	7,75E−8	5,61E−9	5,62E−9	5,62E−9	3,84E−9	3,85E−9	3,85E−9	−1,08E−7	−1,09E−7	−1,09E−7
Abiotic depletion, minerals & metals	kg Sbe	4,54E−2	4,54E−2	4,54E−2	7,06E−2	7,07E−2	7,07E−2	5,06E−2	5,07E−2	5,07E−2	1,18E−2	1,18E−2	1,18E−2	−1,78E−1	−1,78E−1	−1,78E−1
Abiotic depletion of fossil resources	MJ	8,46E−5	8,46E−5	8,46E−5	2,63E−4	2,63E−4	2,63E−4	9,44E−5	9,45E−5	9,45E−5	5,44E−4	5,45E−4	5,45E−4	−6,46E−3	−6,47E−3	−6,47E−3
Water use	m³e depr.	0.00E +00	0.00E +00	0 0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00	0.00E +00
Use of secondary materials	kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Biogenic carbon content in product	kg C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

SCENARIO DOCUMENTATION

MANUFACTURING ENERGY SCENARIO DOCUMENTATION

Scenario parameter	Value
Electricity data source and quality	Electricity production, hydro, reservoir, non-alpine region (Reference product: electricity, high voltage), Finland, Ecoinvent 3.6, year: 2019
Electricity CO_2e / kWh	0.0487
Diesel data source and quality	Diesel, burned in building machine (Reference product: diesel, burned in building machine), World, Ecoinvent 3.6, year: 2019
Diesel CO_2e / kWh	0.327
Heating data source and quality	Heat production, natural gas, at industrial furnace >100kw (Reference product: heat, district or industrial, natural gas), Europe, Ecoinvent 3.6, year: 2019
Heating CO_2e / kWh	0.247

TRANSPORT SCENARIO DOCUMENTATION

Scenario parameter	Value
A4 Truck >32 metric ton Euro 5, kgCO_2e / tonkm	0.0902
A4 average transport distance, Truck, km	364
Transport capacity utilization, %	75
Bulk density of transported products, kg/m^3	338/450/555
Volume capacity utilisation factor for nested packaged products	1

END OF LIFE SCENARIO DOCUMENTATION

Scenario parameter	Value		
	338 kg/m^3	450 kg/m^3	555 kg/m^3
Collection process – kg collected separately	338	450	555
Collection process – kg collected with mixed waste	0	0	0
Recovery process – kg for re-use	0	0	0
Recovery process – kg for recycling	311	414	511
Recovery process – kg for energy recovery	0	0	0
Disposal (total) – kg for final deposition	27	36	44
Scenario assumptions e.g. transportation (kg)	50	50	50

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ABOUT THE MANUFACTURER

Bauroc group, with headquarter in Estonia, is the largest producer of aircrete i.e. autoclaved aerated concrete (AAC) products in the Northern Europe. The family owned group which was established 2001, operates two state of the art AAC factories in Estonia and Latvia. The machinery of both plants come from two of the most famous German manufacturers -Wehrhahn and Hess.

The brand "**bauroc**" symbolizes a wide range of building products from autoclaved aerated concrete, which are used throughout the field of construction. Word "bau" is "construction" in German language and second part of the word "roc" means, that all products are made from ecological stone material – natural mineral-based autoclaved aerated concrete.

High quality, purely natural and mineral raw materials as well as modern technology guarantee that bauroc products are among the leading autoclaved aerated concrete products worldwide thanks to their technical properties. Bauroc is a member of the European Autoclaved Aerated Concrete Association EAACA and all products have the CE certification. Thanks to high quality products, the bauroc brand has become popular in many countries.

Bauroc wide range of products are sold in Estonia, Latvia, Lithuania, Sweden, Finland, Denmark, Iceland, Poland, Switzerland and Germany.

There has been continuous process in product development and product mix has increased significantly during 20 years in business. bauroc product portfolio includes wide range of block products, reinforced lintels, large roof and wall elements, instruments, dry mixes and accessories for installing the products.

We are not speaking only about very light aircrete products, but much larger product mix.

Bauroc brand can be recognised from bright orange colour, all products have been wrapped in orange folio during the whole 20 years in business.

EPD AUTHOR AND CONTRIBUTORS

Production of **bauroc** factory has production control certificates and CE-marking.

Manufacturer	Bauroc AS
EPD author	Anni Oviir, Anette Iital Rangi Maja OÜ, www.lcasupport.com
EPD verifier	Silvia Vilčeková, Silcert, s.r.o.
EPD program operator	The Building Information Foundation RTS sr
Background data	This EPD is based on Ecoinvent 3.6 (cut-off) database
LCA software	The LCA has been created using One Click LCA Pre-Verified EPD Generator for Cementitious Products

ANNEX: ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

Impact category	Unit	A1-A3			A4			A5	B1-B7
		338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³		
Global warming potential	kg CO_2e	1,21E2	1,52E2	1,8E2	8,5E0	1,13E1	1,38E1	MND	MND
Depletion of stratospheric ozone	kg CFC11e	5,47E−6	7,05E−6	8,54E−6	1,6E−6	2,12E−6	2,61E−6	MND	MND
Acidification	kg SO_2e	2,03E−1	2,51E−1	2,95E−1	1,74E−2	2,31E−2	2,84E−2	MND	MND
Eutrophication	kg PO_4 3e	6,39E−2	7,7E−2	1,11E−1	3,52E−3	4,67E−3	5,74E−3	MND	MND
Photochemical ozone formation	kg C_2H4e	8,82E−3	1,09E−2	1,28E−2	1,11E−3	1,47E−3	1,8E−3	MND	MND
Abiotic depletion of non-fossil res.	kg Sbe	1,03E−3	1,36E−3	1,48E−3	1,46E−4	1,94E−4	2,38E−4	MND	MND
Abiotic depletion of fossil resources	MJ	8,01E2	1,03E3	1,23E3	1,33E2	1,77E2	2,17E2	MND	MND

Impact category	Unit	C1			C2			C3			C4			D		
		338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³	338 kg/m³	450 kg/m³	555 kg/m³
Global warming potential	kg CO_2e	1,11E0	1,47E0	1,82E0	1,52E0	2,03E0	2,5E0	1,23E0	1,64E0	2,03E0	1,4E−1	1,86E−1	2,29E−1	−2,55E0	−3,4E0	−4,19E0
Depletion of strato-spheric ozone	kg CFC11e	1,9E−7	2,54E−7	3,13E−7	2,87E−7	3,82E−7	4,71E−7	2,12E−7	2,83E−7	3,49E−7	4,64E−8	6,19E−8	7,63E−8	−6,98E−7	−9,3E−7	−1,15E−6
Acidification	kg SO_2e	1,64E−3	2,19E−3	2,7E−3	3,12E−3	4,16E−3	5,13E−3	1,83E−3	2,45E−3	3,02E−3	5,63E−4	7,5E−4	9,25E−4	−9,13E−3	−1,22E−2	−1,5E−2
Eutrophication	kg PO_4 3e	2,9E−4	3,86E−4	4,76E−4	6,3E−4	8,4E−4	1,04E−3	3,23E−4	4,31E−4	5,31E−4	1,09E−4	1,45E−4	1,79E−4	−1,97E−3	−2,62E−3	−3,23E−3
Photochemical ozone formation	kg C_2H4e	1,69E−4	2,25E−4	2,78E−4	1,98E−4	2,64E−4	3,25E−4	1,89E−4	2,52E−4	3,11E−4	4,13E−5	5,5E−5	6,78E−5	−6,23E−4	−8,31E−4	−1,03E−3
Abiotic depletion of non-fossil res.	kg Sbe	1,7E−6	2,27E−6	2,79E−6	2,62E−5	3,49E−5	4,3E−5	1,9E−6	2,53E−6	3,12E−6	1,3E−6	1,73E−6	2,14E−6	−3,67E−5	−4,89E−5	−6,03E−5
Abiotic depletion of fossil resources	MJ	1,53E1	2,04E1	2,52E1	2,39E1	3,18E1	3,92E1	1,71E1	2,28E1	2,81E1	3,97E0	5,3E0	6,54E0	−6,02E1	−8,03E1	−9,9E1

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