

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804 for

Autoclaved Aerated Concrete (AAC)

from Gaziantep Ytong



Programme :	EPD Turkey, a fully aligned regional programme www.epdturkey.org	The International EPD [®] System www.environdec.com
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Program Information

Programme	EPD Turkey, a fully aligned regional programme	The International EPD® System
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Product Category Rules (PCR):

The International EPD® System's PCR 2012:01 Construction Products and Construction Services, Version 2.3, 2018-11-15

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

EPD process certification

EPD verification



Third party verifier: Vladimír Kočí, PhD

Approved by: The International EPD® System

System Boundaries :

Cradle to gate

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.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Company Information

The company, Gaziantep Ytong, the first foreign capital joint venture of SANKO group, was established in 1997 on partnership of Turk Ytong, Ytong International and SANKO group companies.

The company started the production in 1998 in Gaziantep, on 80 000 m² area, 10 000 m² of this covered. The production is made with the most advanced and unique technology in Gaziantep Ytong , one of the five plants of Ytong in Turkey.

In Gaziantep Ytong, autoclaved aerated concrete and reinforced aerated building material production made according to TS EN 771-4 and TS 453 standards, there are production of G2/04 ve G4/06 building blocks, reinforced materials, ytong bonding adhesives, Alsecco plaster and Masterkim

construction chemicals. Gaziantep Ytong, producing materials having the properties of modern construction Technologies, has the capacity of 450 000 m³ per year as a block material. The company has TS EN ISO 9001 Quality, TS 18001 Safety and TS 14001 Environment management certificates and CE marking, fullfills the 13% of Turkey autoclaved aerated concrete production capacity.

The name of ytong is identified with the modern buildings, constructed by autoclaved aerated concrete blocks and known with constant and reliable image all over the World. Ytong brand has the highest production capacity of autoclaved aerated gas concrete in the world totally in 21 countries and 77 plants, took part of best known brands of this century in October 2009, in Germany.



Product Information

The products mentioned are unreinforced building blocks in various formats made of autoclaved aerated concrete /TS EN 771-4: 2011/. AAC belongs to the porous steam-cured light-weight concrete group. The ground quartzite is mixed with gypsum, cement, quicklime and recycled AAC materials (slurry and powder) that has been reduced to small pieces, adding water and aluminum powder, in a mixer, until it becomes a watery suspension. It is then poured into a casting mould. The aluminum reacts in an alkaline milieu. Thus, gaseous hydrogen is formed which creates pores in the mass and escapes without leaving any residue. The pores usually have a diameter 0.5- 1.5 mm and are filled exclusively with air. After setting once, semisolid raw blocks are created, from

which the autoclaved aerated concrete building components are then cut with high precision. The formation of the final qualities of the building component occurs during the subsequent steam-curing over 5 to 12 hours at approximately 190° C with approximately 12 bar pressure in steam pressure kettles or autoclaves, as they are called. The used substances create calcium hydro silicates, which correspond to the naturally occurring mineral tobermorite. The reaction of the material is complete when removed from the autoclave. Therefore, the reaction does not take as long as the hardening of concrete. Once the steaming process is complete, the steam is used for other autoclave cycles. AAC blocks are then piled onto wooden pallets and shrink-wrapped in polyethylene wrap.



Application

Unreinforced AAC building blocks are used for bricklaid, monolithic, load bearing and non-loadbearing infill walls. As intended, direct contact with ground water is avoided thanks to the constructional features.



Technical Specifications

Name	Value	Unit
Compressive strength \geq	1.5 - 5	N/mm ²
Gross density	300 - 600	kg/m ³
Tensile strength	0.24 - 1	N/mm ²
Modulus of elasticity	750 - 2250	N/mm ²
Thermal conductivity	0.085 - 0.16	W/(mK)
Water vapour diffusion resistance factor acc. to EN 4108-4	0.5	-
Moisture content at 23 °C, 80%	4	M.-%

Base Materials

Name	Value (%)
Quartzite	40-55
Portland cement	25-35
Gypsum	3-10
Quick Lime	3-10
Recycled Ytong Slurry	5-15
Aluminium powder	0-1

*In addition, 40-60% water is used (in relation to the solid substances).

Reference Service Life

AAC does not change once it leaves the autoclaves. When used as intended, it is boundlessly stable. It was assumed that the average life expectancy of AAC is 100 years.

LCA Information

Declared Unit

The declared unit is 1 m³ of unreinforced Autoclaved Aerated Concrete (AAC) products (relevant to average density 381 kg/m³)

Time Representativeness

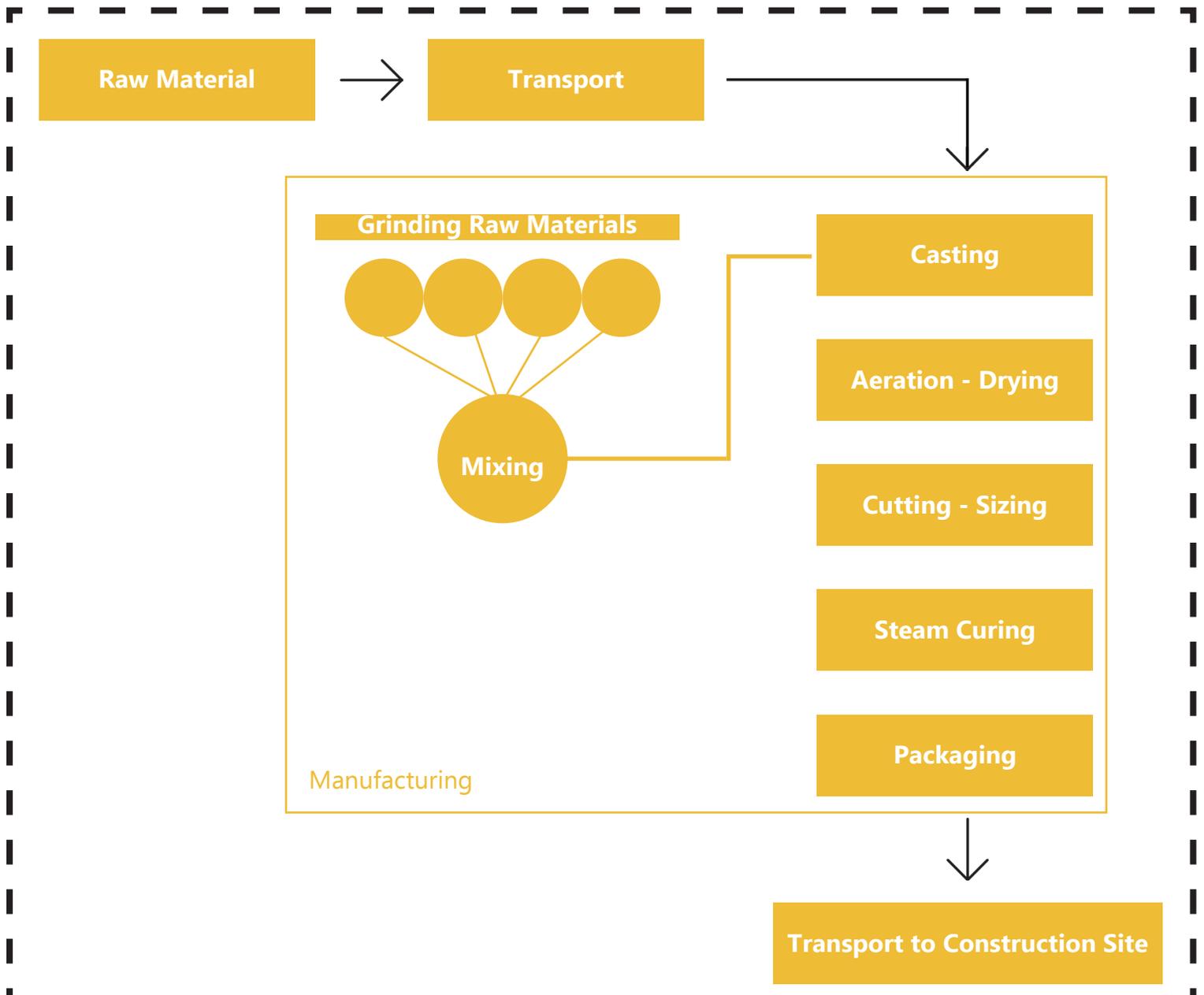
2019

Database(s) and LCA Software Used

TLCID 1.0 (Turkish Lifecycle Inventory Database), Ecoinvent 3.5, SimaPro 9.0

The inventory for the LCA study is based on the 2019 production figures for AAC by Gaziantep Ytong in Gaziantep/Turkey production plants.

System Boundary



Description of System Boundary

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw Materials Supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste processing	Disposal	Reuse-Recycling-Recovery Potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Description of the system boundary (X = Included in LCA, MND= Not Declared)

A1: Raw Material Supply

Production starts with raw materials. Raw material supply includes raw material extraction and pre-treatment processes before production.

A2: Transportation

Transport is relevant for delivery of raw materials and other materials to the plant and the transport of materials within the plant.

A3: Manufacturing

Manufacturing starts with further processing raw materials needed for the production followed by mixing all raw materials with excess water at certain proportions, casting of the slurry formulation, expansion-aeration, cutting to sizes, high-pressure steam curing and packaging of the final products. The end products are then packaged or sold as bulk.

A4: Transport From the Gate to the Site

Transport of final product to construction site is taken as the weight average values for transport to customers in 2019.

More Information

Life cycle assessment calculations required for this EPD were done using SimaPro 9.0 life cycle assessment software. Energy calculations were obtained using Cumulative Energy Demand (LHV) v 1.00. Global Warming Potential (GWP), Eutrophication (EP), Abiotic Depletion Fossil Fuels (ADPF), Abiotic Depletion Elements (ADPE), Ozone Layer Depletion (ODP), Photochemical Oxidation (POCP) and Acidification (AP) were calculated using the CML-IA baseline method and finally, Water Scarcity (WSI) were calculated using AWARE methodology.

Accordingly, hazardous and non-hazardous waste amounts were also allocated from 2019 total waste arisings.

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in AAC, either above the threshold for registration with the European Chemicals Agency or above 0.1 % (wt/wt).

Comparability

A comparison or an evaluation of EPD data is only possible where EN 15804 has been followed, and the same building context and product-specific characteristics of performance are taken into account and the same stages have been included in the system boundary.



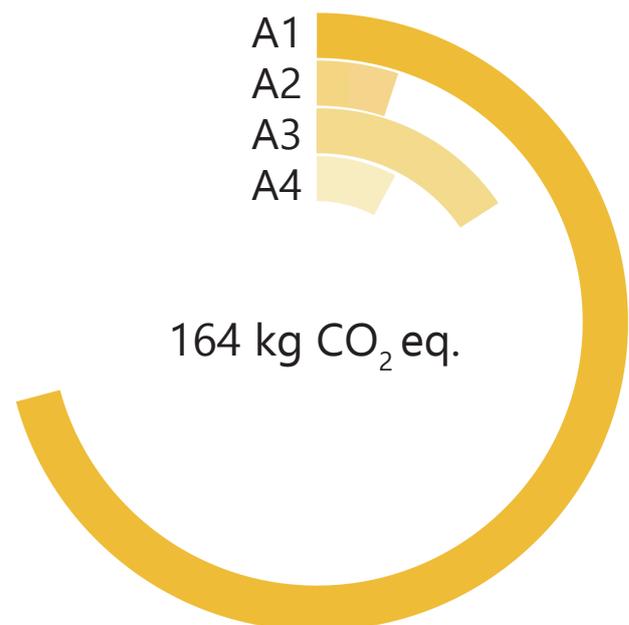
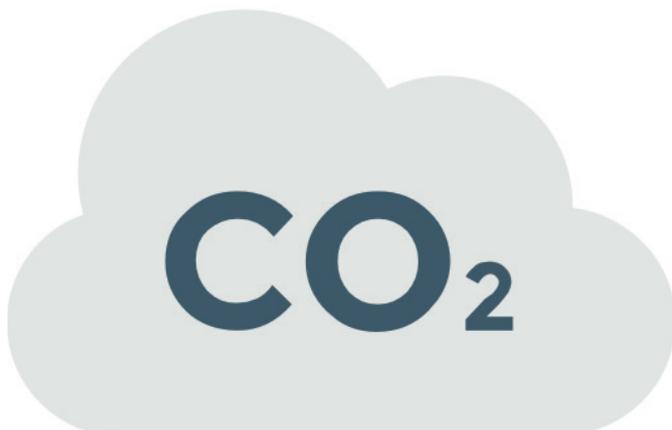
LCA Results

ENVIRONMENTAL IMPACTS, 1 m³ AAC

Parameter		Unit	A1-A3	A4
Global warming Potential	Fossil	[kg CO ₂ eq.]	150	13.8
	Biogenic	[kg CO ₂ eq.]	0.087	0.003
	Land Use & Transformation	[kg CO ₂ eq.]	0.160	0.004
	Total	[kg CO ₂ eq.]	150	13.8
Ozone Layer Depletion Potential		[kg CFC11 eq.]	7.01E-6	2.53E-6
Acidification Potential		[kg SO ₂ eq.]	0.390	0.045
Eutrophication Potential		[kg PO ₄ ³⁻ eq.]	0.123	0.010
Photochemical Oxidation Potential		[kg C ₂ H ₄ eq.]	0.027	0.003
Abiotic Depletion Potential		[kg Sb eq.]	218E-6	41.0E-6
Abiotic Depletion Potential (Fossil Resources)		[MJ]	1002	209

Global Warming Potential

Global warming is a concept expressing warming of the atmosphere due to climate change. One of the human related activities causing global warming more than everything is combusting on the fossil resources such as petroleum, coal and natural gas. The global warming is expressed in terms kg CO₂ equivalent.



WASTE ARISING, 1 m³ AAC

Parameter	Unit	A1-A3	A4
Hazardous Waste Disposed	[kg]	0.002	0
Hazardous Waste Disposed	[kg]	0.330	0
Radioactive Waste Disposed	[kg]	0	0

RESOURCE USE, 1 m³ AAC

Parameter	Unit	A1-A3	A4
PERE	[MJ]	617	2.13
PERM	[MJ]	0	0
PERT	[MJ]	617	2.13
PENRE	[MJ]	1036	212
PENRM	[MJ]	0	0
PENRT	[MJ]	1036	212
SM	[kg]	41.0	0
RSF	[MJ]	0	0
NRSF	[MJ]	0	0
FW	[m ³]	2.01	0.036
WSI	[m ³ eq.]	77.4	1.46
Legend	PERE: Use of renewable primary energy excluding 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 resources used as raw materials, PENRM: Use of non-renewable primary energy resources used as raw materials, PENRT: Total use of non-renewable primary energy resources, SM: Use of secondary material, RSF: Use of renewable secondary fuels, NRSF: Use of non-renewable secondary fuels, FW: Use of net fresh water, WSI: Water Scarcity Index.		

OUTPUT FLOWS, 1 m³ AAC

Parameter	Unit	A1-A3	A4
Components for reuse	[kg]	0	0
Materials for Recycling	[kg]	0	0
Materials for Energy Recover	[kg]	0	0
Exported Energy, Electricity	[MJ]	0	0
Exported Energy, thermal	[MJ]	0	0

References

/GPI/ General Programme Instructions of the International EPD® System. Version 3.0

/TS EN ISO 9001/ Quality management systems – Requirements

/TS 18001 / Occupational Health and Safety Management System - Requirements

/TS 14001/ Environment Management System- Requirements

/EN 15804/ EN 15804:2012-04, Sustainability of construction works — Environmental Product Declarations — Core rules for the construction products product category; EN 15804:2012

/ISO 14020:2000/ Environmental labels and declarations — General principles

/ISO 14025/ ISO 14025:2006 Preview Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures

/ISO 14040-44/ ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006) and Requirements and guidelines (ISO 14044:2006)

/The International EPD® System/ The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD®s as well as keeping a library of EPD®s and PCRs in accordance with ISO 14025. www.environdec.com

/Construction Products and Construction Services PCR 2012:01 v.2.2/ Prepared by IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, 2012:01 Version 2.2, DATE 2019-03-03

/Ecoinvent/ Ecoinvent Centre, www.ecoinvent.org

/SimaPro/ SimaPro LCA Package, Pré Consultants, the Netherlands, www.pre-sustainability.com

/TLCID/ Turkish Life Cycle Inventory Database, www.tlcid.org, Turkish Centre for Sustainable Production Research and Design (SÜRATAM), www.suratam.org

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