Environmental Product Declaration

In accordance with ISO 14025 and EN 15804 for:

Autoclaved Aerated Concrete

from

AKG GAZBETON

Programme:	EPD Turkey, a fully aligned regional programme www.epdturkey.org	The International EPD® System www.environdec.com
Programme operator:	EPD Turkey: SÜRATAM – Turkish Centre for Sustainable Production Research & Design Nef 09 B Blok No:7/15, 34415 Kağıthane /Istanbul, Turkey	EPD International AB
EPD registration number:	S-P-01259	
Publication date:	24.05.2018	
Validity date:	08.05.2023	
Geographical scope:	Global	

General Information

Information about the organization

Owner of the EPD	AKG Gazbeton İşletmeleri San. Tic. Ve A.Ş.
Contact person	Ms. Ergül Doğan, Chief of Integrated Management Systems
Phone	+90 (232) 472 12 00
E-mail	ergul.dogan@akg-gazbeton.com
Adress	6170/1 Sokak, No: 7 35070
	Işıkkent, Izmir, TURKEY

Description of the Organisation

AKG Gazbeton is one of the leaders of construction material producers. AKG Gazbeton, autoclaved aerated concrete which has superior heat insulation, fireproof characteristics, earthquake safety due to its lightweight structure, was entitled to have its CE certificate in 2005 as the first wall material producer in Turkey. The company has an annual manufacturing capacity of 524,880 m^3 at its Izmir facilities with an open area of 45,000 m^2 and a closed area of 15,000 m^2, while it has an annual manufacturing capacity of 583,000 m^3 at its Kırıkkale facilities with an open area of 100,000 m^2 and a closed area of 20,000 m^2. Their production capacity at Corlu plant is 625,000 m^3. AKG Gazbeton constitutes a wide range of autoclaved aerated concrete products which are commonly used in all types of construction projects ranging from houses to industrial structures. AKG Gazbeton presents many advantages compared to other construction materials for construction professionals due to its advanced manufacturing technology and superior physical characteristics. AKG Gazbeton manufactures its autoclaved aerated concrete blocks in conformance to EN 771-4 standards and it has its own ISO 9001, ISO 14001 and OHSAS 18001 Quality, Environment and Occupational Health&Safety Management Systems established. All the waste resulting from the production and service processes of AKG Gazbeton is managed in accordance with valid local legal requirements. AKG Gazbeton is conforming the Construction Product Regulation (CPR-305-2011) which a standard issued by European Commission on construction products.

Production Sites

Izmir Plant	Kemalpaşa Cad. 6170/1 Sokak, No: 7 35070 Işıkkent, İZMİR
Kırıkkale Plant	Yeşilköy Mahallesi Sanayi Caddesi No:35 Bahşılı 71100, KIRIKKALE
Çorlu Plant	Ergene1 OSB, Vakıflar OSB Mahallesi, D100 Caddesi No:12/1 Ergene 59930, ÇORLU

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Product Information

Product Name: Autoclaved Aerated Concrete

Product Description: The products referred are blocks of various formats made of autoclaved aerated concrete (AAC). AAC belongs to the group of porous steam-hardened lightweight concrete. The autoclaved aerated concrete products are made of quartzite, cement, lime, gypsum, aluminium and finally recycled waste slurry (closed-loop). All raw materials are mixed with excess water at certain proportions. Mixed slurry formulation is then poured into the casting moulds. After expansion-aeration stage, the aerated concrete blocks are cut and then they are put into the autoclave in groups for steam curing. Having a porous composition, AKG AACs provide a high order 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. As a low-density solid masonry material, AKG AACs significantly improve the seismic performance and safety of buildings by reducing overall building loads with its low dead weight. AKG AAC is a Class 1 fireproof material that can withstand temperatures up to 1200°C. AKG AACs are manufactured to exact dimensions with very close tolerances, hence providing high levels of accuracy in setting out. Its smooth faces and sharp arises allow fair-faced finishing with or without liquid coatings. Similarly, rendering, where such finish desired, can be kept extremely fine. While it is possible to construct an entire building from the foundations up using AKG AAC components, the many extraordinary properties of the material also allow its use for artwork, such as sculptures, and for other decorative purposes. AKG Gazbeton manufactures AAC products in various sizes such as 5, 7.5, 9, 10, 15, 20, 25, 30, 35, 40 cm and the others required. The autoclaved aerated concrete 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 AAC products are used as interior or exterior walling in all kinds of framed and/or bearing-wall construction. They are used as permanent infill in ribbed floor-deck construction. The AAC products are also used for casting bond beams and they are used as thermal cladding to reinforced concrete surfaces.

UN CPC Code: 37550

Geographical Scope: Global

Composition of Autoclaved Aerated Concrete

Raw Materials	Composition (%)
Quartzite	45 - 55
Cement	16 - 25
Lime	5 - 12
Gypsum	7 - 9
Poring agent	<1

Technical Specications of Autoclaved Aerated Concrete

Specification	Value	Unit
Compressive Strength	1.5 – 6.0	N/mm^2
Gross Density	max. 1000	kg/m^3
Thermal Conductivity	0.082 – 0.16	W/(mK)
Shrinkage as per	0.2	mm/m

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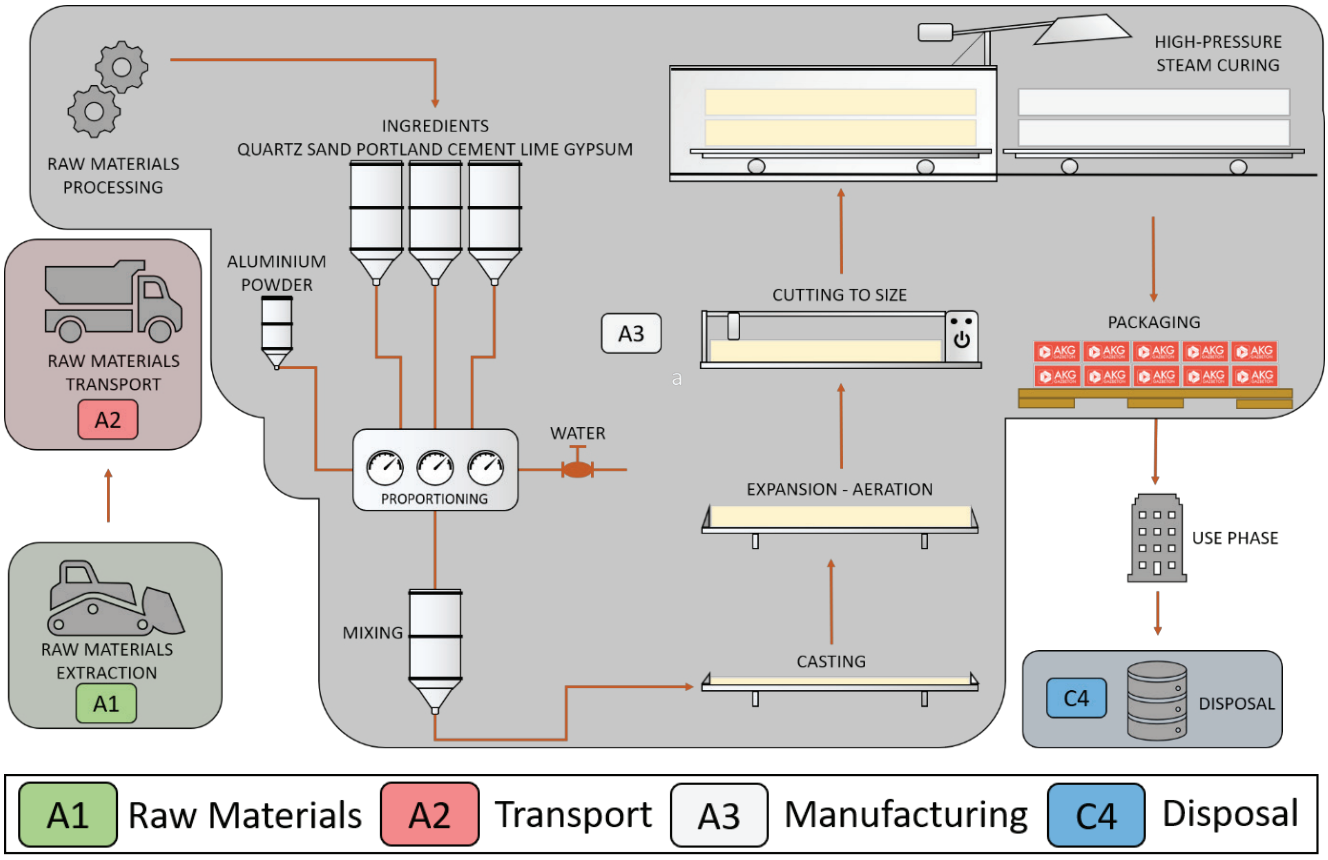
LCA Information

Functional Unit / Declared Unit: The declared unit is 1 m^3 of unreinforced autoclaved aerated concrete products (relevant to average density 385 kg/m^3) in line with the PCR document for Aerated Concrete.

Time Representativeness: Primary data used within the LCA model was obtained from AKG Gazbeton's 2017 production figures.

Database and LCA Software Used: The inventory for the LCA study is based on the 2017 production figures from AKG GAZBETON's three manufacturing plants located in provinces of Izmir, Kırıkkale and Çorlu in Turkey. Raw materials, electricity, natural gas, water use and waste generation data were collected from AKG Gazbeton. For local data specific for Turkey, Turkish Life Cycle Inventory Database (TLCID 1.0) developed by Turkish Centre for Sustainable Production Research and Design (SÜRATAM) was used. For any other background data, the latest version of the Ecoinvent database (3.4) was used. The LCA was modelled with SimaPro 8.5.

System Diagram:



Description of System Boundaries: This is a cradle-to-gate EPD including disposal of product after use. In this study, the system boundary involves raw materials (A1), transport (A2), manufacturing (A3) and disposal (C4). Production starts with raw materials mainly locally sourced, but some transported from other parts of the world. 'Raw material supply' includes raw material extraction and pre-treatment processes before production. Transport is relevant for delivery of raw materials to the plant, the transport of materials within the plant and the transport of packaging materials to the plant. 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. Electric energy, natural gas and diesel for generators are consumed during the manufacturing. Concerning the end of life, all autoclaved aerated concrete products end up at landfill as their final fate. The closed-loop recycling is present in this work. The benefit from open-loop recycling and re-use is not available for this LCA. Packaging waste is assumed to end up at packaging recycling streams due to the relevant national law in Turkey in 2017, which requires manufacturers to have certain percentage of their packaging waste to be recovered (C4).

Excluded Lifecycle Stages: The life cycle stages A4, A5, B1-7 and C1-3 was excluded from the LCA study.

More Information: All energy calculations were obtained using Cumulative Energy Demand V1.10 methodology. Biogenic Carbon Stored in Products, Global Warming Potential(Land-Use and land transformation), Global Warming Potential(Fossil) were calculated with IPCC GWP 100 while other environmental impacts were calculated with the CML-IA baseline V4.2 within SimaPro LCA Software. Within the LCA study, 1% cut-off rule was applied. AKG Gazbeton produces both reinforced and ureinforced AAC. This EPD is relevant to unreinforced AAC hence mass allocation was made between reinforced and unreinforced products based on the production figures at Izmir and Kırıkkale plants. Çorlu manufacturing plant on the other hand produced only unreinforced AAC so no co-product allocation was made.

Reuse-Recovery and Recycling Potential: The AAC products were assumed to end up in the inert landfill sites. Therefore, no possible benefits of open-loop recycling and re-use were taken into account in this LCA work. Closed loop scenario was used at the manufacturing stage but no benefit was taken.

All AAC block products of AKG Gazbeton does not contain any radioactive materials. This performance is tested, approved and reported by Ege University Nuclear Investigations Laboratories, Turkey.

Fire Protection: According to intermational fire classification standards norms, AKG GAZBETON is a Class1 fire-proof material that can withstand temperatures up to 1200°C. With this property, it is an intelligent choice where fire safety is of prime concern. As a side benefit of this property, it is highly resistant to weathering and is therefore a very durable material.

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Content Declaration

This declaration considers cradle-to-gate environmental impacts with options, including modules A1-A3 as required in EN 15804.

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

MND: Module not declared

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

Packaging

Packaging for declared unit (1 m^3) for the product autoclaved aerated concrete is composed of wooden pallet and 0.75 kg of packaging film.

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Environmental Performance

Potential environmental impact

PARAMETER		UNIT	A1	A2	A3	C4
Global warming potential (GWP)	Fossil	kg CO_2 eq.	158	4.56	32.2	2.20
	Biogenic	kg CO_2 eq.	$21.2x10^{-3}$	$831x10^{-6}$	$41.4x10^{-3}$	0.6
	Land use and land transformation	kg CO_2 eq.	$42.6x10^{-3}$	$1.34x10^{-3}$	$83.0x10^{-3}$	$1.01x10^{-3}$
	TOTAL	kg CO_2 eq.	159	4.59	32.5	2.80
Acidification potential (AP)		kg SO_2 eq.	$332x10^{-3}$	$19.0x10^{-3}$	$90x10^{-3}$	$16.0x10^{-3}$
Ozone depletion potential (ODP)		kg CFC 11 eq.	$5.18x10^{-6}$	$851x10^{-9}$	$2.10x10^{-6}$	$716x10^{-9}$
Eutrophication potential (EP)		kg PO_4^{3-} eq.	$86.5x10^{-3}$	$4.32x10^{-3}$	$35.8x10^{-3}$	$5.99x10^{-3}$
Formation potential of tropospheric ozone (POCP)		kg C_2H_4 eq.	$19.6x10^{-3}$	$761x10^{-6}$	$6.52x10^{-3}$	$914x10^{-6}$
Abiotic depletion potential – Elements		kg Sb eq.	$48x10^{-6}$	$8.12x10^{-6}$	$27.1x10^{-6}$	$2.52x10^{-6}$
Abiotic depletion potential – Fossil resources		MJ, net calorific value	736	69.9	493	60.7
Water scarcity potential		m^3 eq.	611	0.521	63.9	2.93

Use of resources

PARAMETER		UNIT	A1	A2	A3	C4
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	51.3	0.907	588	1.60
	Used as raw materials	MJ, net calorific value	0	0	0	0
	TOTAL	MJ, net calorific value	51.3	0.907	588	1.60
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	839	75.4	560	65.5
	Used as raw materials	MJ, net calorific value	0	0	0	0
	TOTAL	MJ, net calorific value	839	75.4	560	65.5
Secondary material		kg	0	0	0	0
Renewable secondary fuels		MJ, net calorific value	0	0	0	0
Non-renewable secondary fuels		MJ, net calorific value	0	0	0	0
Net use of fresh water		m^3	207	4.26	112	3.11

Waste production and output flows

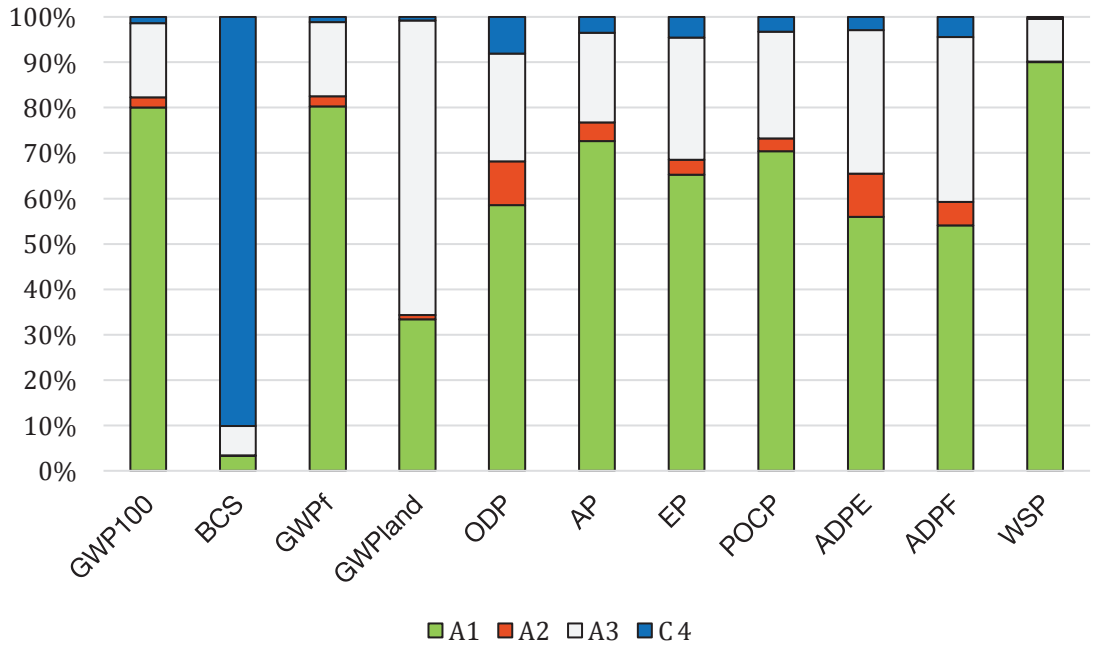
Waste production

PARAMETER	UNIT	A1	A2	A3	C4
Hazardous waste disposed	kg	-	-	0.092	-
Non-hazardous waste disposed	kg	-	-	0.215	385
Radioactive waste disposed	kg	-	-	-	-

Output flows

PARAMETER	UNIT	A1	A2	A3	C4
Components for reuse	kg	-	-	0	0
Material for recycling	kg	-	-	0	0
Materials for energy recovery	kg	-	-	0	0
Exported energy, electricity	MJ	-	-	0	0
Exported energy, thermal	MJ	-	-	0	0

Environmental Interpretation



Legend: GWP: Global Warming Potential, BCS: Biogenic Carbon Stored in Products, GWPf: Global Warming Potential (fossil), GWPland: Global Warming Potential (land use and land transformation), ODP: Ozone Depletion Potential, AP: Acidification Potential, EP: Eutrophication Potential, POCP: Formation Potential of Tropospheric Ozone, ADPE: Abiotic depletion potential – Elements, Abiotic depletion potential – Fossil, WSP: Water Scarcity Potential

Within almost all of the environmental impacts A1: Raw Materials is the dominant stage. Biogenic Carbon Stored in products category is vastly composed of Disposal stage due to the emissions from landfills at the end of life stage of Autoclaved Aerated Concrete.

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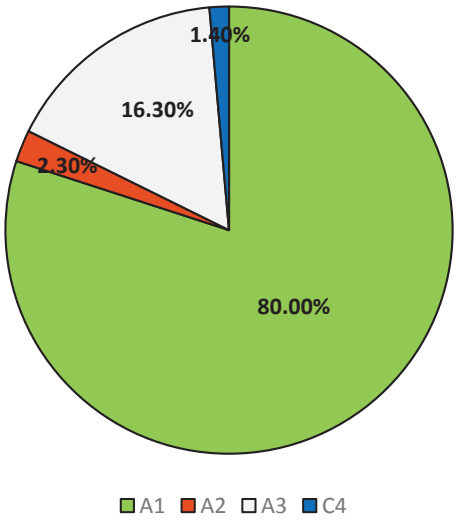
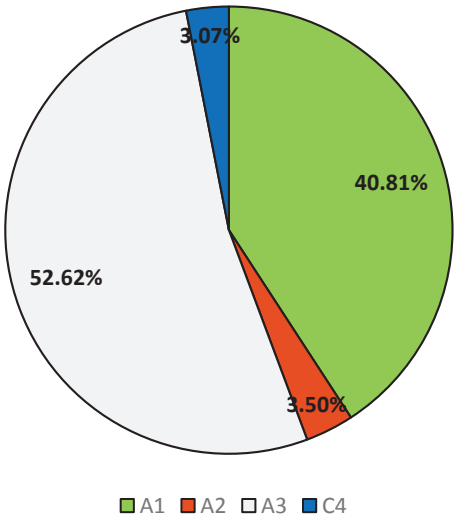


Global warming potential to each life cycle stage for Autoclaved Aerated Concrete



Total energy contributions to each life cycle stage for Autoclaved Aerated Concrete

Programme-Related Information and Verification

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.

Programme:	EPD Turkey, a fully aligned regional programme EPD Turkey: SÜRATAM – Turkish Centre for Sustainable Production Research & Design Nef 09 B Blok No:7/15, 34415 Kağıthane /Istanbul, Turkey www.epdturkey.org The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com
EPD registration number:	S-P-01259
Published:	24.05.2018
Valid until:	08.05.2023
Product Category Rules:	PCR 2012:01. Construction Products and Construction Services. 2.2
Product group classification:	UN CPC 37550
Reference year for data:	2017
Geographical scope:	Global

- CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

- Product category rules (PCR): PCR 2012:01. Construction Products and Construction Services. 2.2

- PCR review was conducted by: Martin Erlandsson, IVL Swedish Environmental Research Institute

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

- Third party verifier: Vladimír Kocí PhD, LCAstudio, CZ

In case of recognised individual verifiers:
Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:
Yes No

References

General Programme Instructions of the International EPD® System. Version 3.0.PCR 2012:01. Construction Products and Construction Services. Version 2.2.

/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 14025/ ISO 14025:2006-10, Preview Environmental labels and declarations — Type III environmental declarations — Principles and procedures

/ISO 14040-44/ DIN EN 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

/EPD Turkey/ EPD Turkey is fully aligned regional programme of the The International EPD® System run by the SÜRATAM, Turkish Centre for Sustainable Production Research and Design. www.epdturkey.org

/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

/ISO 9001/ DIN EN ISO 9001:2008 Quality management systems – Requirements

/TS EN 771-4/ Specification for masonry units - Part 4: Autoclaved aerated concrete masonry units

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

Contact Information

EPD Owner:

Headquarters and Factory: Kemalpaşa Cad. 6170/1 Sokak, No: 7
35070 Işıkkent, İZMİR
www.akg-gazbeton.com
info@akg-gazeton.com

Contact: Ms. Ergül Doğan, Chief of Integrated Management Systems Management +90 (232) 472 12 00

LCA Owner:

Metsims Sustainability Consulting
Elmas Studio Levent
Lalegul Sok. No:7/18
34415 4.Levent - Istanbul, Turkey
www.metsims.com
+90 (212) 281 13 33

Programme Holder:

EPD Turkey
SÜRATAM – Turkish Centre for Sustainable Production Research & Design Nef 09 B Blok No:7/15, 34415 Kağıthane /Istanbul, Turkey
www.epdturkey.org
info@epdturkey.org
+90 (212) 803 88 58

Programme Operator:

EPD International AB
info@environdec.com

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