ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**AKG GAZBETON ISLETMELERI SAN. TIC. Ve A.S**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-AKG-20130049-CBD1-EN
Issue date	26.04.2013
Valid to	25.04.2018

Autoclaved Aerated Concrete

AKG GAZBETON İŞLETMELERİ SAN. TİC. Ve A.Ş

Institut Bauen und Umwelt e.V.

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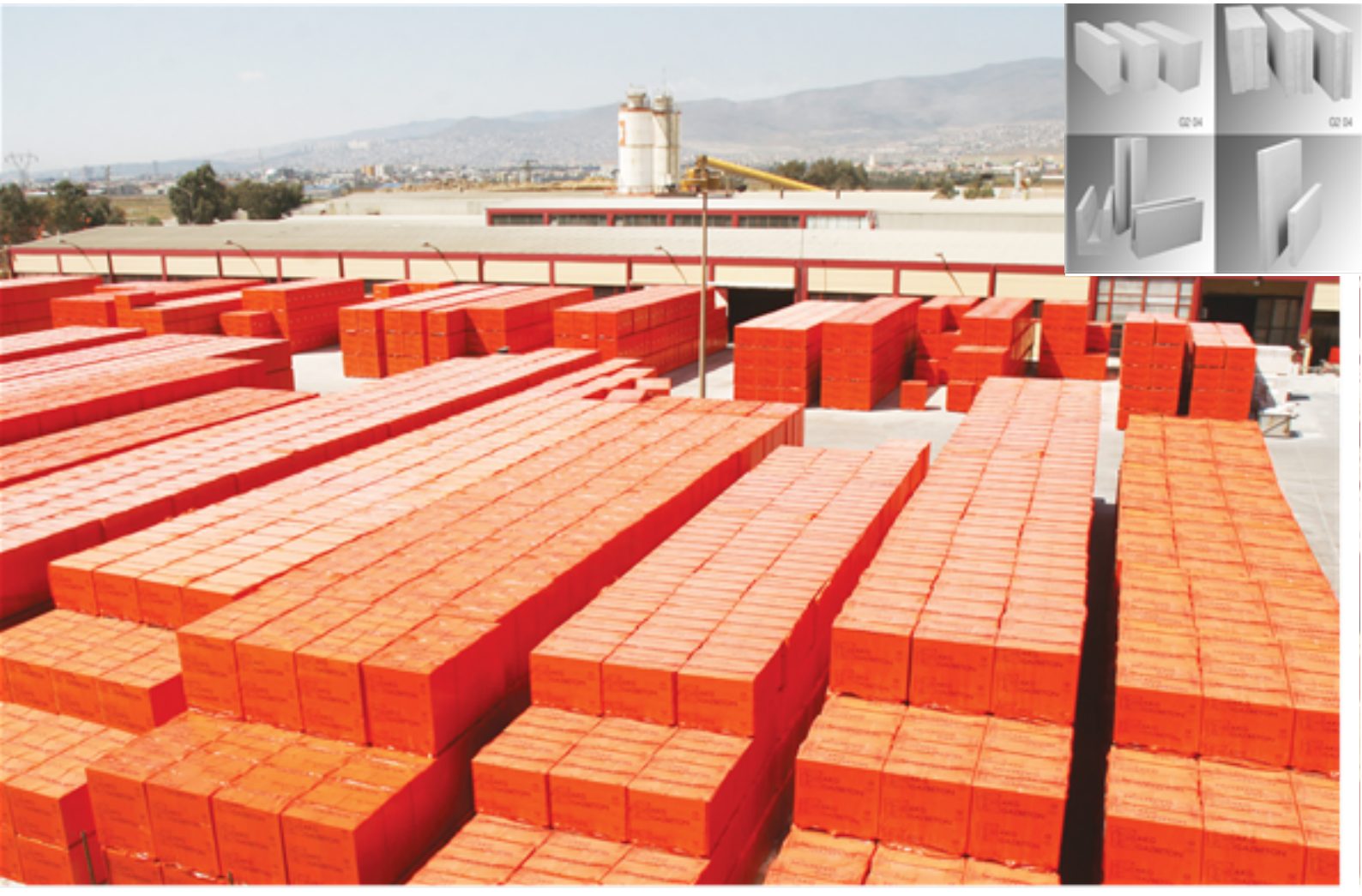

General Information

AKG GAZBETON İŞLETMELERİ SAN. TİC. Ve A.Ş

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IBU - Institut Bauen und Umwelt e.V.
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Declaration number
EPD-AKG-20130049-CBD1-EN

This Declaration is based on the Product Category Rules:
Aerated concrete, 07-2012
(PCR tested and approved by the independent expert committee)

Issue date
26.04.2013

Valid to
25.04.2018

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Prof. Dr.-Ing. Hans-Wolf Reinhardt
(Chairman of SVA)

Autoclaved Aerated Concrete

Owner of the Declaration
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6170/1 Sokak No: 7
35070 Isikkent, Izmir

Declared product / Declared unit
Autoclaved Aerated Concrete (AAC) products/ 1m^3

Scope:
This EPD declaration is relevant to unreinforced Autoclaved Aerated Concrete (AAC) products manufactured by AKG Gazbeton at Izmir, Kırıkkale and Corlu plants in Turkey. It applies to all unreinforced AAC products manufactured by AKG Gazbeton. It is described as declaration of an average product as an average from several of the manufacturer's plants. The owner of the declaration shall be liable for the underlying information and evidence.

Verification

The CEN Norm EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025
☐ internally ☒ externally

Dr. Olivier Muller
(Independent tester appointed by SVA)

Product

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 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.

Application
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 also used as permanent infill in ribbed floor-deck construction, casting bond beams and as thermal cladding to reinforced concrete surfaces.

Technical Data
If relevant for the declared product, the following technical construction data in the delivery status must be provided with reference to the test standard.

Delivery status
Each pallet of AKG Gazbeton delivery contains about 0.675-1.35 m3 AAC.

Constructional data

Name	Value	Unit
Compressive strength	1.5 - 6	N/mm^2
Gross density	300 - 600	kg/m^3
Tensile strength	0.2 - 1.5	N/mm^2
Modulus of elasticity	1250 - 2250	N/mm^2
Thermal conductivity	0.082 - 0.16	W/(mK)
Shrinkage as per ZA-PBP-07-01, modified /EN 680/ must be indicated; adherence to the shrinkage value of < 0.2 mm/m should be guaranteed (max. value)	0.2	mm/m

Base materials / Ancillary materials
The autoclaved aerated concrete products are made of quartzite (40-50%), Portland cement (20-30%), lime (6-12%), gypsum (5-10%), aluminium (0.1-0.2%) and finally recycled waste slurry (closed-loop) (15-20%). In addition, water content of the mix is about 40-50% of the total mixture.

There are no products that can be included in "Candidate List of Substances of Very High Concern for Authorisation" and raw materials used are not part of the EU /REACH/ regulation.
The AAC products have a long life and can be disposed of in inert landfill sites at the end of their useful life.

Packaging
AAC products are packed onto wooden pallets and shrink–wrapped with polyethylene.

Reference service life
This EPD is relevant to cradle to factory gate as well as disposal of product after use. Therefore no reference to useful life is required.

LCA: Calculation rules

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

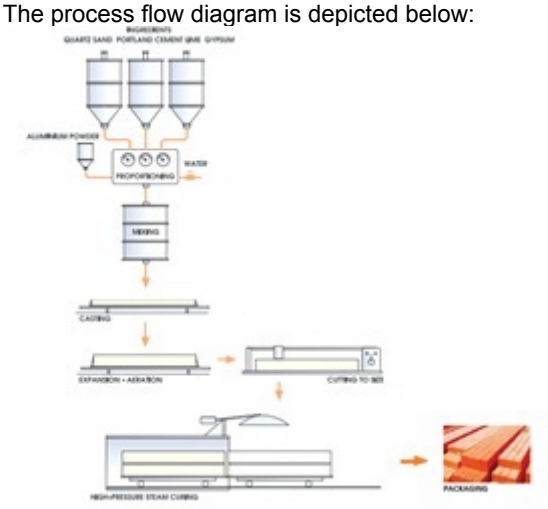
Declared unit

Name	Value	Unit
Declared unit	1	m^3
Gross density (Relevant to standard AAC, +/- %3)	385	kg/m^3
Conversion factor to 1 kg	0.002597403	-

System boundary
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).

'Raw materials stage' includes extraction and processing before production. 'Manufacturing stage' 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. 'Transport stage' is only relevant for delivery of raw materials to the plant and forklift usage within the factory.
Concerning the end of life, all autoclaved aerated concrete products end up at landfill as their final fate. The closed-loop recycling exists in this work. The benefit from open-loop recycling and re-use is not available for this LCA.

The process flow diagram is depicted below:



Cut-off criteria
Where there are no data available, raw materials that are a minor constituent of the product amounting less than 1% of total raw materials are excluded in this study.

Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account.

This EPD is comparable with AAC products that comply with the PCR document Part B: Aerated Concrete and are evaluated according to EN 15804 norms.

LCA: Scenarios and additional technical information

Reuse-Recovery-and Recycling potential (D)
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.

Radioactivity
All mineral raw materials contain minor amounts of naturally radioactive substances. These are tested by the Council of Turkish Atomic Energy and accredited by Turkish Accreditation Body, TURKAK.

Fire Protection
According to /DIN 4102/ norms, AKG GAZBETON is a Class 1 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.

LCA: Results

The results of the LCA with the indicators as per EPD requirement are given in the following tables for product manufacture (A1, A2, A3) and the loads beyond the system boundaries (C4).

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement[1)]	Refurbishment[1)]	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-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

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m³ of Autoclaved Aerated Concrete

Parameter	Unit	A1-A3	C4
Global warming potential	[kg CO_2-Äq.]	1.87E+2	6.04E+0
Depletion potential of the stratospheric ozone layer	[kg CFC11-Äq.]	9.82E-6	1.59E-6
Acidification potential of land and water	[kg SO_2-Äq.]	3.95E-1	3.43E-2
Eutrophication potential	[kg PO_4^{3-}- Äq.]	9.37E-2	8.78E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg Ethen Äq.]	1.02E-1	1.37E-2
Abiotic depletion potential for non fossil resources	[kg Sb Äq.]	6.52E-1	7.28E-2
Abiotic depletion potential for fossil resources	[MJ]	1.42E+3	1.68E+2

RESULTS OF THE LCA - RESOURCE USE: 1 m³ of Autoclaved Aerated Concrete

Parameter	Unit	A1-A3	C4
Renewable primary energy as energy carrier	[MJ]	5.23E+2	1.25E+0
Renewable primary energy resources as material utilization	[MJ]	0.00	0.00
Total use of renewable primary energy resources	[MJ]	5.23E+2	1.25E+0
Non renewable primary energy as energy carrier	[MJ]	1.42E+3	1.68E+2
Non renewable primary energy as material utilization	[MJ]	0.00	0.00
Total use of non renewable primary energy resources	[MJ]	1.42E+3	1.68E+2
Use of secondary material	[kg]	IND	IND
Use of renewable secondary fuels	[MJ]	IND	IND
Use of non renewable secondary fuels	[MJ]	IND	IND
Use of net fresh water	[m³]	1.70E+0	1.76E-1

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m³ of Autoclaved Aerated Concrete

Parameter	Unit	A1-A3	C4
Hazardous waste disposed	[kg]	1.04E-1	IND
Non hazardous waste disposed	[kg]	3.81E-2	3.85E+2
Radioactive waste disposed	[kg]	IND	IND
Components for re-use	[kg]	IND	IND
Materials for recycling	[kg]	IND	IND
Materials for energy recovery	[kg]	IND	IND
Exported electrical energy	[MJ]	IND	IND
Exported thermal energy	[MJ]	IND	IND

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TS 453
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ISO 14040-44
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Registration , Evaluation , Authorisation and Restriction of CHemicals
http://www.reach-info.de

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