

ENVIRONMENTAL PRODUCT DECLARATION

Lightweight Expanded Clay Aggregates – Structural density



In compliance with EN 15804+A2

Issue date

20 August 2021

Valid to

19 August 2026



1 GENERAL INFORMATION

Owner of the EPD

ARGEX
Kruibeeksesteenweg162
B-2070 Burcht
Belgium

LCA practitioner

WeLOOP
254 rue du Bourg
59130 Lambersart
France

Declared product / Declared Unit

1 m³ of bulk ARGEX AM4/8-700 structural density
lightweight expanded clay aggregates

PCR

EN 15804+A2 is considered as the core PCR

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Scope

The Life Cycle Assessment (LCA) was carried out according to EN 15804+A2. Specific data from ARGEX in Belgium, and from the Ecoinvent 3.6 database were used. The LCA was carried out for the manufacturing phase (including modules A1, A2, and A3). This EPD Cradle to Gate covers Argex aggregates intended to be physically integrated in mortar, concrete, bituminous mixtures, or hydraulically bound mixtures. Structural density expanded clay aggregates can be used in different applications as readymix structural concrete, precast concrete, concrete blocks masonry and bituminous mixtures.

Verification

The CEN standard EN 15804+A2 serves as the core PCR

Independent verification of the declaration according to ISO 14025

internally

externally

Verifier name

Frank Werner

Verifier contact

Kammelenbergstrasse 30, CH-9011 St. Gallen

Verifier company name

Werner Environment & Development



2 PRECAUTIONS USING THE EPD FOR THE PRODUCTS COMPARISON

The construction products EPDs can be comparable if they are in agreement with the standard EN 15804+A2.

The EN 15804+A2 defines that § 5.3 Comparability of EPD for construction productions, the conditions in which the construction products can be comparable:

“Comparison of the environmental performance of construction products using the EPD information shall be based on the product’s use in and its impacts on the building, and shall consider the complete life cycle (all information modules).”

3 PRODUCT DESCRIPTION

Structural density lightweight expanded clay aggregate is a granular ceramic material made from natural clay. The clay is mixed with organic material, dried and expanded to 4-5 times its original volume in a rotary kiln at a temperature of about 1150°C. The output expanded clay aggregate Argex granules are sieved and blended into different gradings of products. The mainstream after sieving is the AM4/8-700. The product is distributed in bulk.

The main components of the product are:

Composition	Quantity
Clay (on-site Argex pit)	90%
Iron oxides (Europe)	8-9%
Additives (Europe)	1-2%

This product does not contain materials listed in the “Candidate List of Substances of Very High Concern for authorisation”.



Figure 1: Structural density Argex aggregates

4 TECHNICAL DATA

The structural Argex AM4/8-700 expanded clay aggregate used in bounded applications is complying the EN 13055 “Lightweight Aggregates” standard.

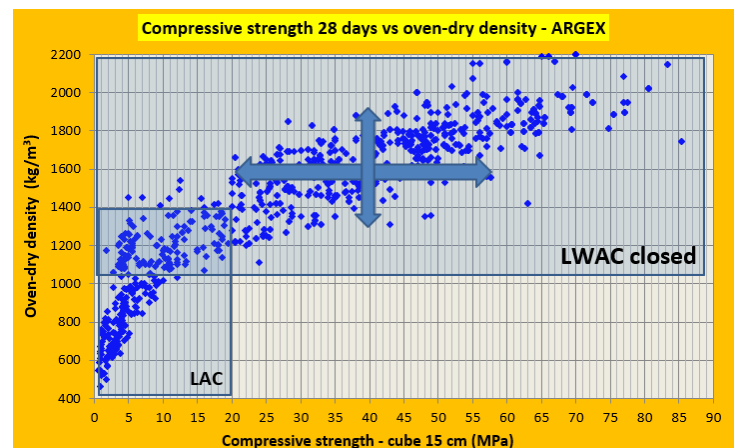
Technical properties	Value	Unit
Loose bulk density	700	kg/m ³
Particle density (prd)	1230	Kg/m ³
Bulk crushing resistance	> 10,0	N/mm ²
Polished stone value (PSV)	> 65	
Los Angeles (LA)	< 25	%
Reaction to fire	A1	Euroclass

Additional characteristics: see DoP1, in accordance with EN 13055 & technical sheet (<https://www.argex.eu>).

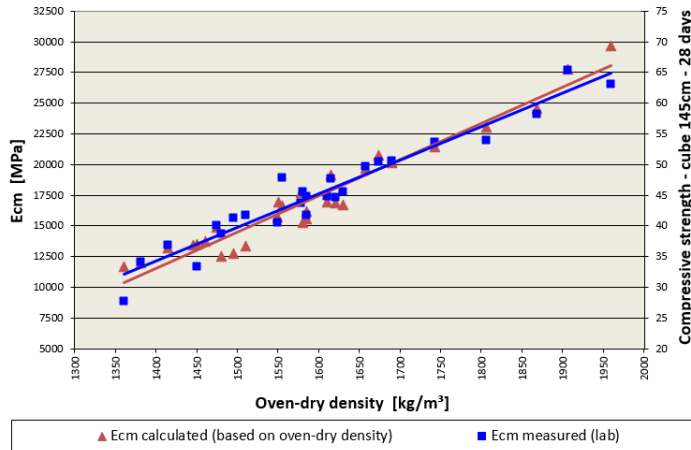
Thanks to its own properties, the AM4/8-700 Argex aggregate has proven its technical potential in a wide range of applications over the past decades. For instance, the structural lightweight concrete providing wide range of characteristics based on huge combinations of mix designs from open-structure concrete to high strength concrete.

Examples – lightweight Argex concrete

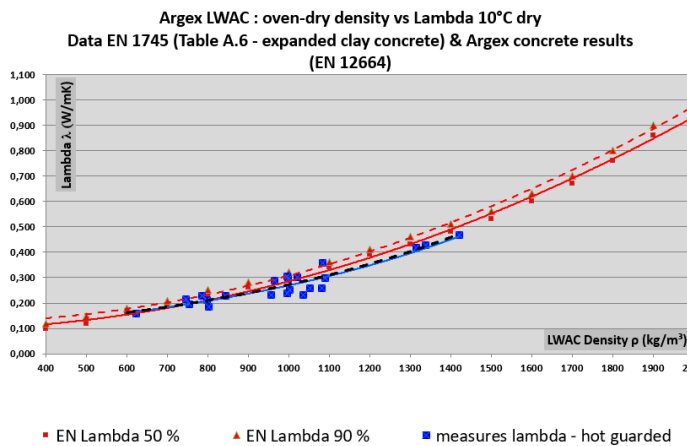
- correlation compressive strength vs oven-dry density



correlation elasticity modulus vs oven-dry density



- correlation thermal conductivity vs oven-dry density



5 RAW MATERIAL SUPPLY (A1)

Clay is extracted close to ARGEX plant (1 km). Diesel and electricity consumption used during the extraction is accounted. Iron oxides and other additives are also part of the final product composition and are considered as waste, without economic value. Hence no environmental impacts are attributed.

6 TRANSPORT TO THE MANUFACTURER

Clay is transported by conveyor belt. Iron oxides and other additives are transported by truck and boat.

7 PRODUCT MANUFACTURING

The manufacturing is composed of kneading, grind, compress, kiln and crush processes. Information on fuels and its emissions used in the kiln, as well as electricity and water for the rest of the processes were considered in this module.

The product is not packed.

8 REFERENCE SERVICE LIFE (RSL)

Structural density Argex expanded clay products are already installed in existing buildings in previous decades (product intrinsic material properties lead in good long-term performances). Several construction works can be found in Europe containing the product from decades ago. Examples are provided in the LCA background report.

The reference service life is estimated at 100 years (installed products are still in use) if the product is installed according to the manufacturers' and suppliers' guidelines. The RSL is based on available average EPDs, expert judgment, and corresponding to the average lifespan of a building.

Parameters	Values
Reference Service Life	100 years
Declared product properties (at the gate) and finishes, etc	EN 13055
Composition	Clay 90% Iron oxides 8-9% Additives 1-2%
Design application parameters (if instructed by the manufacturer)	EN 13055
An assumed quality of work, when installed in accordance with the manufacturer's instructions	EN 13055
Outdoor environment (for outdoor applications)	Not applicable
Indoor environment (for indoor applications)	Not applicable
Usage conditions	Not applicable
Maintenance	Not applicable



9 LCA CALCULATION RULES

The declared unit is 1m³ of structural density expanded clay aggregates from ARGEX.

Name	Value	Unit
ARGEX AM 4/8-700	1	m ³

Scope

This EPD is cradle to gate. The Argex aggregates are physically integrated in mortar, concrete, bituminous mixtures or hydraulically bound mixtures. Due to this integration with other products during installation so aggregates cannot be physically separated from those products at the end of life and are no longer identifiable at end of life because of a physical or chemical transformation process. In this study, the product stage information modules A1, A2, and A3 are considered.

A1: raw material extraction and processing;

A2: transport of the raw materials to the manufacturer;

A3: manufacturing of the product.

Data gaps and cut-offs

Argex provided the data used in this study. Some plausibility and completeness assessments and checks were conducted for some inputs. For a few remaining data, no extended assessment was conducted, therefore accepting data gaps.

In all cases, it is assumed that the cut-off criteria of EN 15804 are met.

Information on excluded processes

The following processes are excluded:

- The effects of capital goods and infrastructural processes have been excluded.

- Flows related to human activities such as employee transport and administration activities are excluded.

Background data

When calculating the environmental impact categories, SimaPro version 9.1.0.7 was used as well as environmental data from the Ecoinvent database, version 3.6, released in September 2019.

Information on allocation

No co-product allocation occurs in the product foreground system.

No multi-input allocation occurs in the product system.

The allocations from the background database are kept intact.

The excavated pit where the clay was extracted from is used for landfilling inert waste. Thus, the energy used to extract the clay is allocated 50/50 to clay (as the product raw material) and landfilling operations.

Period under review

Data is collected from the year 2020.

Impact categories and related indicators

This EPD presents the indicators according to the EN 15804:2012+A2:2019 Annex C, with the characterization factors from EC-JRC.

The abiotic depletion potential is calculated and declared in two different indicators: ADP-mineral&metals (include all non-renewable, abiotic material resources i.e. excepting fossil resources) and ADP-fossil.

10 INFORMATION ON BIOGENIC CARBON CONTENT

The product does not present biogenic carbon content. The product is not packed, thus biogenic carbon content for packaging is not applicable.

Biogenic Carbon Content	Value (expressed per declared unit DU)
Biogenic carbon content in product	0 kg C/DU
Biogenic carbon content in accompanying packaging	Not applicable



11 ADDITIONAL INFORMATION ON RELEASE OF DANGEROUS SUBSTANCES TO INDOOR AIR, SOIL AND WATER DURING THE USE STAGE

INDOOR AIR

Not applicable as this product is not in contact with indoor air.

SOIL AND WATER

This product does not release dangerous substances in contact with soil and water, since it is integrated in bounded products (concrete, mortar, etc).

12 LCA RESULTS

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries	
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	Use	Maintenance	Repair	Replacement	Refurbishment	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	
☒	☒	☒	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MN	MND	MND

* MND : Module Not Declared

Core environmental impact categories	Unit	Production		
		A1 Raw Materials	A2 Transport	A3 Manufacturing
Climate change total	kg CO2 equiv/FU	2.50E+00	3.59E-01	1.52E+02
Climate change fossil	kg CO2 equiv/FU	2.49E+00	3.58E-01	1.52E+02
Climate change biogenic	kg CO2 equiv/FU	1.30E-02	7.61E-04	9.02E-02
Climate change luluc	kg CO2 equiv/FU	2.15E-03	4.09E-04	3.25E-02
ODP	kg CFC 11 equiv/FU	5.34E-07	5.32E-08	4.04E-06
AP	mol H+ equiv/FU	1.89E-02	1.83E-03	7.07E+00
EP - freshwater	kg (PO4)3- equiv/FU	2.48E-05	9.61E-06	5.29E-03
EP - marine	kg N equiv/FU	8.00E-03	5.04E-04	1.81E-01
EP - terrestrial	mol N equiv/FU	8.83E-02	5.59E-03	2.01E+00
POCP	kg Ethene equiv/FU	2.41E-02	1.57E-03	9.02E-01



Depletion of abiotic resources - minerals&metals ²	kg Sb equiv/FU	2.79E-06	3.89E-06	5.63E-05
Depletion of abiotic resources - fossil fuels ²	MJ/FU	5.69E+01	4.99E+00	6.34E+02
Water use ²	m ³ water eq deprived /FU	3.38E-01	3.14E-02	5.91E+00
Resource use categories	Unit	Production		
		A1 Raw Materials	A2 Transport	A3 Manufacturing
PERE	MJ/FU, net calorific value	3.09E+00	2.50E-01	2.34E+02
PERM	MJ/FU, net calorific value	0.00E+00	0.00E+00	0.00E+00
PERT	MJ/FU, net calorific value	3.09E+00	2.50E-01	2.34E+02
PENRE	MJ/FU, net calorific value	5.87E+01	5.60E+00	7.61E+02
PENRM	MJ/FU, net calorific value	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ/FU, net calorific value	5.87E+01	5.60E+00	7.61E+02
SM	kg/FU	0.00E+00	0.00E+00	0.00E+00
RSF	MJ/FU, net calorific value	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ/FU, net calorific value	0.00E+00	0.00E+00	0.00E+00
FW	m ³ water eq/FU	1.01E-02	1.07E-03	9.44E-02
Waste and output flows	Unit	Production		
		A1 Raw Materials	A2 Transport	A3 Manufacturing
Hazardous waste disposed	kg/FU	7.39E-05	8.99E-06	2.93E-04
Non-hazardous waste disposed	kg/FU	2.62E-01	2.35E-01	3.55E+00
Radioactive waste disposed	kg/FU	4.90E-04	2.73E-05	3.73E-03
Components for reuse	kg/FU	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg/FU	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg/FU	0.00E+00	0.00E+00	0.00E+00
Exported energy	kg/FU	0.00E+00	0.00E+00	0.00E+00
Additional impact categories	Unit	Production (cont.)		
		A1 Raw Materials	A2 Transport	A3 Manufacturing
PM	disease incidence	4.63E-07	1.83E-08	4.29E-05
IRHH ¹	kg U235 eq/FU	4.88E-01	2.21E-02	3.77E+00
ETF ²	CTUe/FU	2.44E+01	5.08E+00	2.89E+02
HTCE ²	CTUh/FU	6.62E-10	1.11E-10	2.60E-08
HTnCE ²	CTUh/FU	1.64E-08	3.89E-09	2.41E-07
Land Use Related impacts ²	dimensionless	1.12E+01	2.54E+00	1.04E+03





¹This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

²The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

GWP total = total Global Warming Potential (Climate Change); GWP-luluc = Global Warming Potential (Climate Change) land use and land use change; ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels; WDP = water use (Water (user) deprivation potential, deprivation-weighted water consumption); 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 resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water; HTCE = Human Toxicity – cancer effects; HTnCE = Human Toxicity – non cancer effects; ETF = Ecotoxicity – freshwater; (potential comparative toxic unit); PM = Particulate Matter (Potential incidence of disease due to PM emissions); IRHH = Ionizing Radiation – human health effects (Potential Human exposure efficiency relative to U235);



Owner of the EPD	<p>ARGEX Kruibeeksesteenweg162 B-2070 Burcht Belgium</p>	
Practitioner of the EPD	<p>WeLOOP 254 rue du Bourg 59130 Lambersart France</p>	
Project report	<p>Background Report Normal Expanded Clay Aggregate V2.7</p>	
Verification Verifier name Date	<p>15804:2012+A2:2019</p> <p>Frank Werner 20 August 2021</p>	<p>Dr. Frank Werner Environment & Development</p>

