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ECO EPD registration number: 00001034

Lightweight Expanded Clay Aggregate

ISSUE DATE: 02/08/2019

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ARGEX - ARGILA EXPANDIDA, S.A.



VERSION 1.1. EDITION JULY 2015

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1. GENERAL INFORMATION

1.1. The DAPHabitat System

Program operator:	Associação Plataforma para a Construção Sustentável www.centrohabitat.net centrohabitat@centrohabitat.net	
Address:	Departamento Engenharia Civil Universidade de Aveiro 3810-193 Aveiro	
Email address:	deptecnico@centrohabitat.net	
Telephone number:	(+351) 234 401 576	
Website:	www.daphabitat.pt	
Logo:		

1.2. EPD owner


Name of the owner:	Argex - Argila Expandida, S.A.
Production site:	Industrial Area of Bustos, Azurveira, 3770-011 Bustos - Portugal
Address (head office):	Industrial Area of Bustos, Azurveira, 3770-011 Bustos - Portugal
Telephone:	Industrial Area of Bustos: +351 234 751 533 Eng.º José Ávila e Sousa +351 236 210 160
E-mail:	argex@argex.pt
Website:	www.argex.pt
Logo:	
Information concerning the applicable management Systems:	Environmental Management System (EN ISO 14001:2015) – Certificate Nr.: A - 0576 valid until 08/05/2021, issued by EIC (Empresa internacional de Certificação, SA) Quality Management System (EN ISO 9001:2008) in implementation stage
Specific aspects regarding the production:	SIC Code 23992: MANUFACTURE OF OTHER MISCELLANEOUS NON-METALLIC MINERAL PRODUCTS
Organization's environmental policy:	<p>The protection of the environment and the rational use of natural resources has played an important role in the management of Argex - Argila Expandida SA, which recognizes that its activities cause environmental impacts at several levels, namely in the descriptors water, soil, air, energy, noise and landscape. Argex - Argila Expandida S.A. is aware of the fragility of the environment and the need to control its environmental impacts, thus it establishes environmental protection as one of its main business objectives.</p> <p>To ensure compliance with this objective, the organization has developed the following guidelines:</p> <ul style="list-style-type: none"> • Comply with applicable environmental laws and regulations, as well as other requirements related to their environmental aspects and impacts; • Commit to continuous improvement and pollution prevention to ensure the satisfaction

of employees and stakeholders;



- Evaluate and monitor all its activities and analyse/identify the significant environmental aspects and impacts, considering the environmental aspects of its activity and those of future activities to be developed;
- Establish and periodically review objectives and targets in order to reduce the environmental impacts of the activity;
- Optimize waste management generated by the company's activity;
- Prevent and reduce the risk of emission of pollutants in the event of an accident;
- Train, inform and involve all employees in the management and development of the environmental management system;
- Promote communication and collaboration with stakeholders to meet the environmental requirements of Argex - Argila Expandida S.A.

The Administration of Argex - Argila Expandida, S.A., undertakes the commitment to periodically review this Environmental Management System Policy, which is documented, implemented, maintained and communicated as appropriate, in order to ensure its effectiveness.

1.3. Information concerning the EPD

Authors:	CERIS - Civil Engineering Research and Innovation for Sustainability, Vera Durão and José Dinis Silvestre	
Contact of the authors:	Av. Rovisco Pais 1049-001 Lisboa Phone contact: +351 218 418 431; E-mail: vera.durao@tecnico.ulisboa.pt	
Emission date:	2019-08-02	
Registration date:	2019-11-06	
Registration number:	DAP 006:2019	
ECO Platform registration number:	00001034	
Valid until:	2024-08-01	
Representativity of the EPD (location, manufacturer, group of manufacturers):	This is the cradle-to-gate EPD of one (1) product produced in one (1) industrial unit belonging to a single producer (Argex, Argila Expandida, S.A.).	
Where to consult explanatory material:	www.argex.pt	
Type of EPD:	EPD from cradle to gate (A1-A3)	

1.4. Demonstration of the verification

External independent verification, accordingly with the standard ISO 14025:2009 and EN 15804:2012+A1:2013	
Certification Body	Verifier
	
(CERTIF – Associação para a Certificação)	(Ricardo Mateus Universidade do Minho)

1.5. EPD Registration


Program Operator

(Plataforma para a Construção Sustentável)

1.6. PCR of reference

Name:	<ol style="list-style-type: none"> 1. PCR: Basic module for construction products and services 2. PCR: Thermal Insulation
Emission date:	<ol style="list-style-type: none"> 1. September 2015 2. December 2014
Number of registration on the data base:	<ol style="list-style-type: none"> 1. RCP-mb001 2. RCP004:2014
Version:	<ol style="list-style-type: none"> 1. Version 2.0 2. Version 1.1
Identification and contact of the coordinator (s):	<ol style="list-style-type: none"> 1. PCR: basic module for construction products and services <ul style="list-style-type: none"> • Marisa Almeida marisa@ctcv.pt • Luís Arroja arroja@ua.pt • José Silvestre jds@civil.ist.utl.pt 2. PCR: Thermal Insulation <ul style="list-style-type: none"> • José Dinis Silvestre jose.silvestre@ist.utl.pt • Manuel Duarte Pinheiro manuel.pinheiro@ist.utl.pt
Identification and contact of the authors:	<ol style="list-style-type: none"> 1. PCR: basic module for construction products and services <ul style="list-style-type: none"> • Marisa Almeida marisa@ctcv.pt • Luís Arroja arroja@ua.pt • José Silvestre jds@civil.ist.utl.pt • Fausto Freire • Cristina Rocha • Ana Paula Duarte • Ana Cláudia Dias • Helena Gervásio • Victor Ferreira • Ricardo Mateus ricardomateus@civil.uminho.pt • António Baio Dias 2. PCR: Thermal Insulation <ul style="list-style-type: none"> • José Dinis Silvestre jose.silvestre@ist.utl.pt • Manuel Duarte Pinheiro manuel.pinheiro@ist.utl.pt
Composition of the Sector Panel:	<ol style="list-style-type: none"> 2. PCR: Thermal Insulation <ul style="list-style-type: none"> • Amorim Isolamentos • Sofalca - Soc. Central de Produtos de Cortiça, Lda. • Argex – Argila Expandida, S.A. • Sonae Industria, SGPS, S.A. • IberFibran – Poliestireno Extrudido, S.A. • MasterBlock • Termolan – Isolamentos termo-acústicos, S.A. • Eurofoam – Indústria de poliestireno extrudido, Lda • KnaufInsulation
Consultation period:	<ol style="list-style-type: none"> 1. 18/11/2015 - 18/01/2016 2. 01/08/2013 - 30/11/2013
Valid until:	<ol style="list-style-type: none"> 1. January of 2021 2. December of 2019

1.7. Information concerning the product/product class

Identification of the product:	Lightweight expanded clay aggregate (LWA), in bulk, with a density of 274 kg/m ³ (Argex 8-16)																																												
Illustration of the product:																																													
Brief description of the product:	<p>LWA manufactured by Argex is a lightweight spherical-shaped aggregate, with an internal structure made of ceramic foam with micropores, and a rigid and sturdy surface.</p> <p>This LWA is a natural, ecological, long-lasting, non-combustible and inert product that does not degrade or rot; it is lightweight and capable of storing a certain amount of moisture, which is then slowly released. Its use can reduce the dead load on structures and contributes to significant savings in materials. This aggregate has important thermal and acoustic insulation properties due to its internal pores. Its main characteristics are:</p> <ul style="list-style-type: none"> • Lightness and stable weight; • It does not change over time; • Non-flammable and odourless; • Electrically neutral and hypo-allergenic; • Dimensional resistance and stability; • Thermal and acoustic insulation; • Natural, safe for health and ecological; • Affordable and easy to apply. <p>For the purpose of this EPD, the results indicated refer to the range with the lowest density, corresponding to the product with higher granulometry (Argex 8-16). Because the production process is the same for all products, it is possible to have the LCA results for the products with different grading using a conversion factor, as indicated in the table below.</p> <p>Table 1: Factor to apply to LCA results for different gradings (in relation to the values presented for LWA in the EPD)</p> <table border="1"> <thead> <tr> <th>Product</th> <th>Particle size (mm)</th> <th>Bulk density (kg/m³)</th> <th>Factor to apply</th> </tr> </thead> <tbody> <tr> <td>Argex 0-2</td> <td>0.25-2-0</td> <td>550</td> <td>2.01</td> </tr> <tr> <td>Argex 2-4</td> <td>4.0-8.0</td> <td>358</td> <td>1.31</td> </tr> <tr> <td>Argex 3-8F</td> <td>6.3-12.5</td> <td>300</td> <td>1.09</td> </tr> <tr> <td>Argex 3-8</td> <td>8.0-12.5</td> <td>287</td> <td>1.05</td> </tr> </tbody> </table>	Product	Particle size (mm)	Bulk density (kg/m ³)	Factor to apply	Argex 0-2	0.25-2-0	550	2.01	Argex 2-4	4.0-8.0	358	1.31	Argex 3-8F	6.3-12.5	300	1.09	Argex 3-8	8.0-12.5	287	1.05																								
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Main technical characteristics of the product:	<p>The main technical characteristics of the product are presented in Table 2.</p> <p>Table 2: Summary of the product's technical characteristics</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Test Procedures</th> <th>Declared Value</th> <th>Units</th> </tr> </thead> <tbody> <tr> <td>Particle size distribution</td> <td>EN 933-1</td> <td>8.0-16.0</td> <td>mm</td> </tr> <tr> <td>Crushing resistance (±10%)</td> <td>EN 13055-1:2002/AC:2004</td> <td>1.3</td> <td>N/mm²</td> </tr> <tr> <td>Loose bulk density (±15%)</td> <td>EN 1097-3</td> <td>274</td> <td>kg/m³</td> </tr> <tr> <td>Thermal conductivity</td> <td>EN 12667</td> <td>0.10</td> <td>W/m.°C</td> </tr> <tr> <td>Water absorption</td> <td>EN 1097-6:2000 (Annex C)</td> <td>22.8</td> <td>% dry mass</td> </tr> <tr> <td>Crushed particles</td> <td>EN 13055-1:2002/AC:2004</td> <td>12</td> <td>(mass %)</td> </tr> <tr> <td>Determination of compactation and load bearing capacity</td> <td>EN 13055-2:2004</td> <td>Deformação a 2%: > 500 kPa Deformação a 10%: > 1200 kPa</td> <td>%</td> </tr> <tr> <td>Resistance to disintegration</td> <td>EN 13055-1:2002/AC:2004</td> <td>No Performance Declared</td> <td></td> </tr> <tr> <td>Freezing and thawing resistance</td> <td></td> <td>No Performance Declared</td> <td></td> </tr> <tr> <td>Class of fire resistance</td> <td>Decision of the Commission 96/603/EC, altered by the Decision 2000/605/CE</td> <td>A1 (Incombustible)</td> <td>Euro Class</td> </tr> </tbody> </table>	Parameter	Test Procedures	Declared Value	Units	Particle size distribution	EN 933-1	8.0-16.0	mm	Crushing resistance (±10%)	EN 13055-1:2002/AC:2004	1.3	N/mm ²	Loose bulk density (±15%)	EN 1097-3	274	kg/m ³	Thermal conductivity	EN 12667	0.10	W/m.°C	Water absorption	EN 1097-6:2000 (Annex C)	22.8	% dry mass	Crushed particles	EN 13055-1:2002/AC:2004	12	(mass %)	Determination of compactation and load bearing capacity	EN 13055-2:2004	Deformação a 2%: > 500 kPa Deformação a 10%: > 1200 kPa	%	Resistance to disintegration	EN 13055-1:2002/AC:2004	No Performance Declared		Freezing and thawing resistance		No Performance Declared		Class of fire resistance	Decision of the Commission 96/603/EC, altered by the Decision 2000/605/CE	A1 (Incombustible)	Euro Class
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Description of the products' application:	LWA can be used in: - Lightweight concrete, in precast elements, such as blocks and vault brick; - Thermal and acoustic insulation; - High-strength and lightweight screeds in flat and pitched roofs; - As light filler and drainage in tunnels, underground stations and support walls; - Geotechnical applications; - Hydroponic crop, water and air filters, substrate and green roofs, and soil drainage; - Wastewater treatment plants, among others.
Reference service life:	Not specified
Placing on the market / Rules of application in the market / Technical rules of the product:	<ul style="list-style-type: none"> • Decision No. 768/2008 / EC of the European Parliament and of the Council of 9 July 2008 • Regulation (EC) No 764/2008 of the European Parliament and of the Council of 9 July 2008 • Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 • Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 and its amendments. • Technical Product Standards: <ul style="list-style-type: none"> – EN 13055-1:2002/AC:2004 - Lightweight aggregates – Part 1: Lightweight aggregates for concrete, mortar and grout; – EN 13055-2: 2004 - Lightweight aggregates – Part 2: Lightweight aggregates for bituminous mixtures and surface treatments and for unbound and bound application; – EN 14063-1:2004/AC:2006 - Thermal insulating materials and products - In-situ formed expanded clay lightweight aggregate products (LWA) - Part 1: Specification for the loose-fill products before installation; – EN 15732:2012 - Lightweight fill and thermal insulation products for civil engineering applications (CEA) - Expanded clay lightweight aggregate products (LWA).
Quality control:	Quality control is assured according with the technical standards of the product.
Special delivery conditions:	Not applicable
Components and substances to declare:	Not applicable
History of the LCA studies:	-

2. ENVIRONMENTAL PERFORMANCE OF THE PRODUCT

2.1. Calculation rules of the LCA

Declared unit:	1 m ³ of bulk lightweight expanded clay aggregate, with the density of 274 kg/m ³
Functional unit:	-
System boundaries:	EPD from cradle-to-gate
Criteria for the exclusion:	<p>The following processes were not considered in this study, since they meet the cut-off criteria of 1% use of renewable and non-renewable primary energy and 1% of the total input mass of the unit process where they occur, with a maximum of 5% energy and mass use in the considered stages (A1-A3):</p> <ul style="list-style-type: none"> • Construction of industrial infrastructures, manufacture and exchange of equipment and machinery; • Impacts of infrastructure (vehicle manufacturing, road maintenance) associated with the transport of pre-products and raw materials; • The consumption of water and consumables and the effluents produced in administrative areas and laboratories. In the case of electric energy and waste, the allocation between administrative areas and the production was not possible because information was only available for the unit totals. Thus, in the modelling the whole amounts were considered; • Transport of small consumables to the industrial unit; • Other negligible flows, considering their contribution below the cut-off criteria.
Assumption and limitations:	This EPD represents one (1) product that is produced in one (1) manufacturing unit and may have different granulometries.
Quality and other characteristics about the information used in the LCA:	<p>Production data was collected for the year of 2017, from internal and official records and is according to the reality.</p> <p>Generic data used belongs to Ecoinvent v3.4, ELCD and Simapro industrial database (Industry data 2.0), and meets the quality criteria (age, geographical and technology coverage, plausibility, etc.) for generic data.</p>
Allocation rules:	The manufacturing plant where the expanded clay light aggregate is produced does not produce other products. It was not necessary to use an allocation methodology for the inputs and outputs associated with the product being studied.
Comparability of EPD for construction products:	The EPD of construction products and services cannot be comparable in case they are not produced according to EN 15804 and EN 15942 and according to the comparability conditions determined by ISO 14025.

2.1.1. Flow diagram of input and output of the processes

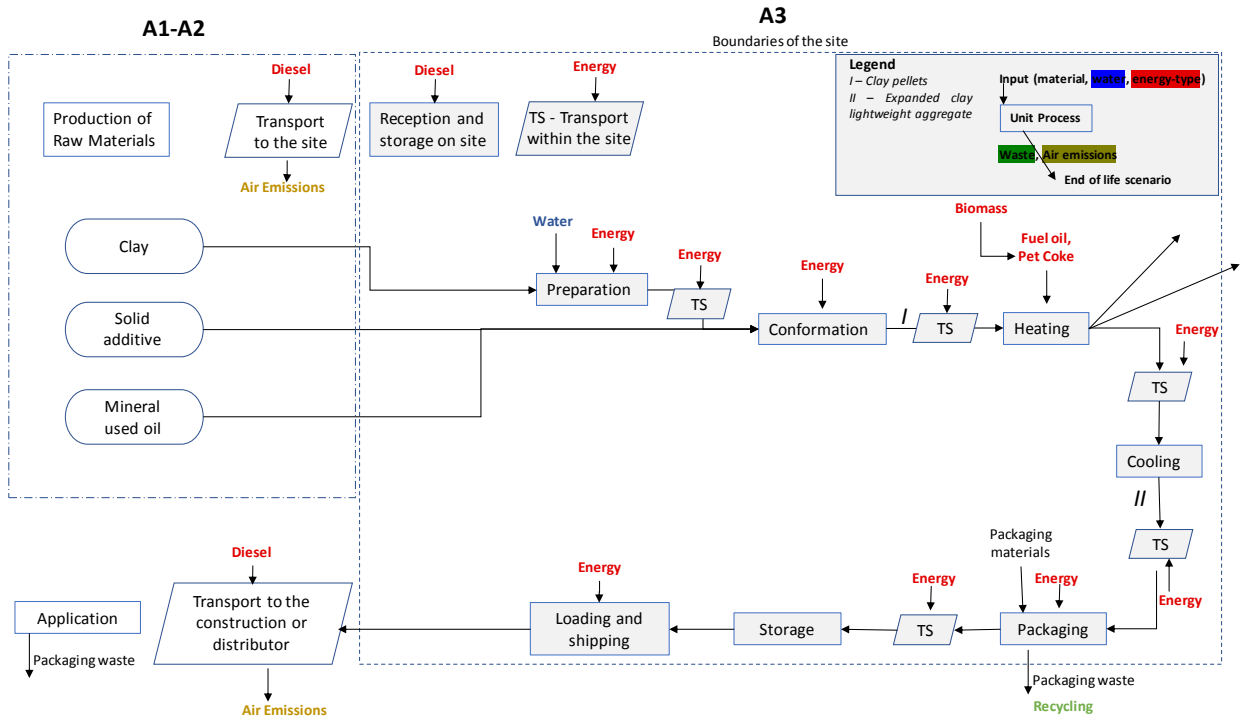


Figure 1. Life cycle stages of Argex’s lightweight expanded clay aggregate (for the product declared in this EPD the packaging process was not considered)

The following paragraphs describe the life cycle stages studied for the development of this EPD.

After raw and ancillary materials arrive at the industrial site, they are stored on site: clay is stored in bulk, mineral oil used in vat and solid additive in silos. The production process then starts with the conversion of the main raw material, clay, into pellets. This process includes the preparation and conformation phases and consists of disaggregation, grinding, lamination and extrusion of clay, and the mix with the admixtures (liquid - mineral oil, and solid - stone cracking powder). Clay pellets then enter the rotary kiln (heating) for the expansion process. The rotary kiln uses two different fuels: petroleum coke and fuel oil. The temperature inside the rotary kiln reaches 1,200 °C. This leads to the fusion of the clay pellets and to the production of a gas in their interior that causes their expansion. At the end of this process, the expanded clay leaves the rotary kiln passing through a cooling process based on vibration and ventilation. The final stage of the LWA production corresponds to the packaging stage, when it exists, or the loading and shipping when it doesn’t.

Transport to the construction site or the distributor is outside of the boundaries of this EPD.

2.1.2. Description of the system boundaries


(✓= included; ✖= module not declared)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-constructions, demolition	Transport	Waste processing	Disposal	Re-use, recovery, recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
✓	✓	✓	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖

2.2. Parameters describing environmental impacts

		Global warming potential; GWP kg CO ₂ equiv.	Depletion potential of the stratospheric ozone layer; ODP kg CFC 11 equiv.	Acidification potential of soil and water, AP kg SO ₂ equiv.	Eutrophication potential, EP kg (PO ₄) ³⁻ equiv.	Formation potential of tropospheric ozone, POCP kg C ₂ H ₄ equiv.	Abiotic depletion potential for non-fossil resources kg Sb equiv.	Abiotic depletion potential for fossil resources MJ, P.C.I.
Raw material supply	A1	2.73E+00	2.84E-07	2.02E-02	4.20E-03	1.02E-03	7.16E-05	3.13E+01
Transport	A2	4.40E-01	8.72E-08	2.28E-03	4.58E-04	7.84E-05	8.50E-07	6.95E+00
Manufacturing	A3	4.24E+01	3.89E-06	8.10E-02	7.43E-03	9.13E-03	4.51E-06	3.41E+02
Total	Total	4.56E+01	4.27E-06	1.03E-01	1.21E-02	1.02E-02	7.70E-05	3.80E+02

LEGEND:

 Product stage


NOTES: P.C.I. – Low Heating Value (LHV).

Units expressed per declared unit (1 m³).

2.3. Parameters describing resource use

		Primary energy						Secondary materials and fuels, and use of water			
		EPR	RR	TRR	EPNR	RNR	TRNR	MS	CSR	CSNR	Net use of fresh water
		MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	kg	MJ, P.C.I.	MJ, P.C.I.	m ³
Raw material supply	A1	2.00E+00	0.00E+00	2.00E+00	3.23E+01	0.00E+00	3.23E+01	0.00E+00	0.00E+00	0.00E+00	4.28E-01
Transport	A2	1.22E-01	0.00E+00	1.22E-01	7.08E+00	0.00E+00	7.08E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-01
Manufacturing	A3	4.93E+01	0.00E+00	4.93E+01	3.48E+02	0.00E+00	3.48E+02	9.86E+00	0.00E+00	0.00E+00	5.71E+00
Total	Total	5.14E+01	0.00E+00	5.14E+01	3.88E+02	0.00E+00	3.88E+02	9.86E+00	0.00E+00	0.00E+00	6.26E+00

LEGEND:

 Product stage

EPR = use of renewable primary energy excluding renewable primary energy resources used as raw materials;

RR = use of renewable primary energy resources used as raw materials;

TRR = total use of renewable primary energy resources (EPR + RR);

EPNR = use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;

RNR = use of non-renewable primary energy resources used as raw materials;

TRNR = total use of non-renewable primary energy resources (EPNR + RNR);

MS = use of secondary material;

CSR = use of renewable secondary fuels;


CSNR = use of non-renewable secondary fuels;

* Not applicable to processes in this factory

NOTE: Units expressed per declared unit (1 m³).

2.4. Other environmental information describing different waste categories

		Hazardous waste disposed kg	Non-hazardous waste disposed kg	Radioactive waste disposed kg
Raw material supply	A1	1.10E-04	1.33E+00	1.48E-04
Transport	A2	3.61E-06	6.13E-01	5.03E-05
Manufacturing	A3	5.25E-03	3.11E+00	2.24E-03
Total	Total	5.36E-03	5.06E+00	2.44E-03

LEGEND:
 Product stage

NOTE: Units expressed per declared unit (1 m³).

2.5. Other environmental information describing output flows

Parameters	Units*	Results
Components for re-use	kg/m ³ Prod	0.00E+00
Materials for recycling	kg/m ³ Prod	4.75E-04
Radioactive waste disposed	kg/m ³ Prod	0.00E+00
Materials for energy recovery	kg/m ³ Prod	0.00E+00
Exported energy	MJ by energy carrier	0.00E+00

NOTE: Units expressed per declared unit (1 m³).

3. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

This EPD evaluates only the production stage of the product, integrating stages A1 to A3. Thus, the following scenarios of the construction stage (modules A4 and A5), stage of use (B1 to B7) and end of life stage (C1 to C4), are not applicable.

3.1. Additional environmental information about the release of dangerous substances

There are no known toxic effects of this product. Due to its properties, no danger to the environment is expected. It is considered an inert product, non-biodegradable.

3.2. Certifications

ARGEX, Argila Expandida, S.A. has implemented the Environmental Management System (EN ISO 14001:2015), certified by EIC (Empresa internacional de Certificação, SA) (Certificate Nr.: A - 0576 valid until 08/05/2021).

The product was awarded the sustainability label by the Sustainable Construction Portal, for complying with 8 of the 10 sustainability principles defined.

3.3. End-of-life management

According to the instructions for use, the product shall be treated as a construction waste in accordance with national regulations. It shall be referred to using the European Waste Code (EWC): 10 12 08 - wastes from the manufacture of ceramic parts, bricks, tiles, tiles and construction products (after the thermal process). Packaging not contaminated with other materials shall be recycled.

3.4. Packaging options of the product - Additional environmental information on the potential added impacts of packaging

Based on the results obtained, this section presents information concerning additional potential environmental impacts of packed LWA: LWA in 1.5 m³ and in 3 m³ big bags and in 50 l bags palletised. These potential additional impacts of the packed product solutions are presented in Table 3, in comparison with the baseline LWA in bulk (results presented in sections 2.2 and 2.3).

Table 3 - Additional potential environmental impacts associated to packaging options, with the bulk supply as a reference

Category indicator	Unit	LWA in 1,5 m ³ bags	LWA in 3 m ³ bags	LWA in 50 l bags palletised
GWP	kg CO ₂ eq	6.4%	5.6%	18.2%
ODP	kg CFC-11 eq	0.3%	0.2%	7.6%
AP	kg SO ₂ eq	14.1%	12.4%	28.6%
EP	kg (PO ₄) ³⁻ eq	10.0%	8.7%	25.9%
POCP	kg C ₂ H ₄ eq	8.1%	7.1%	20.7%
ADP -elem	kg Sb eq	0.2%	0.2%	11.9%
ADP -ff	MJ	18.5%	16.3%	38.5%
TRR	[MJ]	5.2%	4.5%	77.3%
TRNR	[MJ]	18.3%	16.1%	40.7%

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