LATERLITE S.p.A.

ENVIRONMENTAL PRODUCT DECLARATION

LIGHTWEIGHT EXPANDED CLAY STRUCTURAL AGGREGATE
Rubbiano di Solignano (PR), Italy

in compliance with ISO 14025 and EN 15804

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GENERAL INFORMATION

EPD REFERENCES

EPD OWNER: LATERLITE S.p.A. - VIA VITTORIO VENETO 30
43045 RUBBIANO DI SOLIGNANO (PARMA - ITALY)

PROGRAM OPERATOR: EPDITALY - VIA GAETANO DE CASTILLIA 10
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VERIFICATION

This declaration has been developed referring to the EPDItaly, following the General Programme Information; further information and the document itself are available at: www.epditaly.it

EPD document valid within the following geographical area: Italy and European countries according to sales market conditions.

CEN standard EN 15804 served as the core PCR (PCR ICMQ-001/15 Construction products and construction service, rev. 2, 21/04/2017)
Independent verification of the EPD and its data, in accordance with ISO 14025 ☐ EPD process certification (Internal) ■ EPD verification (External)
Third party verifier: ICMQ SpA, via De Castillia, 10 20124 Milano
Accredited by: Accredia

Environmental declarations published within the same product category, though originating from different programs, may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804.

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DECLARED PRODUCT

Loose expanded clay aggregate in bulk (so called “structural Tout Venant”).

DECLARED UNIT

1 m^3 of loose expanded clay aggregate in bulk (structural Tout Venant) with a density of 700 kg/m^3 and a grading of 0-15 mm.

DECLARATION BASED ON

EN 15804:2012+A1 (November 2013). Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.
CEN/TR 16970:2016 (August 2016). Sustainability of construction works – Guidance for the implementation of EN 15804.
ISO 14040:2006 (July 2006). Environmental management – Life Cycle Assessment – Principles and framework.
ISO 14044:2006 (July 2006). Environmental management – Life Cycle Assessment – Requirements and guidelines.
ISO 14025:2006. Environmental labels and declarations – Type III environmental declarations - Principles and procedures.
Regolamento del Programma EPDItaly, versione 3.3, 25/11/2017.
PCR ICMQ-001/15 – rev. 2, Prodotti da costruzione e servizi per costruzioni, Data di emissione: 21/04/2017, Validità fino al: 10/12/2020.

3799 Reference product CPC code (based on version 2.1: 2015)

SCOPE AND TYPE OF EPD

THE APPROACH USED IN THIS EPD IS “CRADLE TO GATE”

TABLE OF MODULES

Table of modules contains the list of modules included or not included in the EPD:
X = module included;
MND = module not declared.

EPD TYPE: Specific for expanded clay products manufactured in the production plant of Rubbiano (Parma, Italy).
EPD GEOGRAPHICAL AREA: Italy and European countries according to sales market conditions.
SOFTWARE: SimaPro 8.3
DATABASE: Ecoinvent 3.3

PRODUCT STAGE			CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS
Raw material supply	Transport	Manufacturing	Transport	Construction - installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De- construction demolition	Transport	Waste processing	Disposal	Reuse - Recovery - Recycling
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	MND	MND

AGENCY

LATERLITE S.p.A.

Laterlite is an Italian company that manufactures and develops lightweight insulating products for construction, civil engineering, geotechnical engineering, industrial uses, agriculture, and landscaping.
The company history began in 1964 when Laterlite first introduced lightweight expanded clay aggregates into Italy. Today the company have three Italian manufacturing plants with the main offices in Milan and a network that covers all of Italy.
Later on during the 1990s the company expanded internationally, structuring their presence in France, Switzerland and Spain and exporting to more than 20 countries in five continents.
The core component of Laterlite products is expanded clay, a lightweight aggregate that has a cellular structure enclosed within a hard, strong ceramic "clinkered" outer shell that optimises the weight-to-strength relationship and gives outstanding thermal insulation characteristics.
From the beginning, the company research and development was focused on creating innovative products based on the material in which Laterlite is specialized: expanded clay. Nowadays, the set of product offered includes lightweight granular material, special lightweight concrete for structural applications, a range of screeds and mortars and a wide selection of lightweight insulating blocks.
Over these 50 years Laterlite have produced and sold more than 50.000.000 cubic meters of expanded clay products, becoming the leader company in its field and, supported by the long experience, helping designers and construction professionals to choose lightweight insulating products for use in construction, sustainable renovation projects and complex engineering projects.
Laterlite works with over 5,000 active customers, in particular building distributors, to support the restructuring and new construction market with products-systems-solutions with high technical performance. The company also collaborates with other leading Italian companies operating in the infrastructure for geotechnical applications and with customers who use expanded clay as a lightweight component for the production of various types of blocks and precast elements.
Laterlite in its Enna plant produces expanded clay using solar electricity thanks to the photovoltaic system and the straw produced in Valle del Dittaino, where the plant is located, as main fuel of the rotatory kiln.
In 2018 Laterlite has realized its first heat recovery system in the plant of Rubbiano. The energy efficiency project designed by Avvenia allows to recover a high quantity, up to 83%, of the heat coming from the cooling system of expanded clay.

PRODUCT

DESCRIPTION

Expanded clay 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 rotary kilns at temperatures of about 1200°C. The output expanded clay aggregate granules are sieved and blended into different grades of products and distributes in bulk or in bags. Each granules has a hard ceramic shell that surrounds a honeycomb core.
Expanded clay aggregate has low density (typical loose bulk density range depending on grain size 320 – 720 kg/m^3) and relatively high strength. Expanded clay aggregate granules are divided into standard Tout Venant (with a grading range of 0-30 mm and a density range of 320 – 560 kg/m^3) and structural Tout Venant (with a grading range of 0-16 and a density range of 620 – 720 kg/m^3). Structural Tout Venant is characterized by a lower degree of expansion and a higher crushing resistance.
Expanded clay is a durable product. The installed product can be reused or recycled.

PRODUCTION PROCESSES

Clay is excavated and transported from the clay pit to the clay storage. In the pre-treatment plant the clay and additives are mixed and transported in a rotatory kiln. The clay mix is dried in the first part of the kiln.
The clay enters the kiln from one end and it moves systematically along the whole length, gradually increasing its temperature. At the other end of the kiln the temperature reaches approx. 1200°C; the organic content in the clay reacts and forms a gas which makes the clay expand, at this stage the clay is in a molten state and the expansion process commences providing a cellular interior to each granulate. The rolling of the granulates within the kiln gives them a round shape and creates the hard outer shell, compact and resistant. The expanded clay granulates are then screened into their various fractions.
The whole production cycle is completely monitored, as well as the production and raw material selection processes which are strictly controlled to insure a uniform and high quality product.

TECHNICAL DATA

TECHNICAL PROPERTY	TYPICAL VALUE
Loose bulk density	700 kg/m^3
Grading	0-15 mm
Compressibility and confined compressive strength	10,0 N/mm^2
Thermal conductivity	0,12 W/mK
Reaction to fire	A1

Expanded clay aggregate:
- is manufactured from naturally occurring clay;
- contains no harmful substances;
- is low density;
- has good mechanical (or compression) resistance;
- is durable and resistant to moisture and chemical attack;
- provides thermal insulation;
- provides acoustic insulation;
- is frost resistant;
- is non-combustible and fire resistant;
- is recyclable or reusable.

APPLICATION

Structural expanded clay aggregates are used extensively in new buildings, restoration of historical buildings and renovation projects.
Structural expanded clay is suitable for:
- lightweight concrete and precast;
- geotechnical engineering and road construction;
- blocks and precast elements, including refractory products;
- hydroponic crop, growing media for plants, water and air filters.

LIFE CYCLE DESCRIPTION

The following paragraphs provide an overview of the product benefits in relation to the life cycle stages. However, note that only production stage is included in the assessment, while construction stage, use stage and end of life stage are out from the system boundaries.

PRODUCTION STAGE
Clay is extracted from clay pits normally located close to the plants, thus keeping haulage costs and carbon emission to a minimum.
The ability to expand natural clay is the strategic and sustainability foundation on which Laterlite is based: 1 m^3 of clay can produce up to 4-5 m^3 of lightweight expanded clay aggregate, then with the use of expanded clay the consumption of soil is reduced by a quarter compared to the extraction and use of traditional materials such as sand.
By considering biodiversity issues, at the planning stage as well as during and after extraction, the company ensures protection of habitats, since clay pits are restored and rehabilitated to preserve biodiversity and create new natural habitats.

CONSTRUCTION STAGE
Expanded clay aggregate has environmental benefits and CO_2 reduction related to transport compared to natural aggregates. Trucks can be loaded with up to 90 m^3 per truck and special blowing vehicles make the application fast and without need for other equipment. Moreover, lightweight expanded clay aggregate is easier to handle at the distributor and at the construction site due to its lightness.

USE STAGE
Expanded clay is flexible in use, is a durable product and do not requires maintenance.
The reaction to fire performarce, the thermal conductivity and the compressive strength of expanded clay do not change with time.
When used in residential buildings, the material offers high level of thermal and acoustic comfort and contribute to improve energy performance and indoor environmental quality.
In infrastructures and in green applications, it guarantiees drainage and avoids extensive load to the construction.

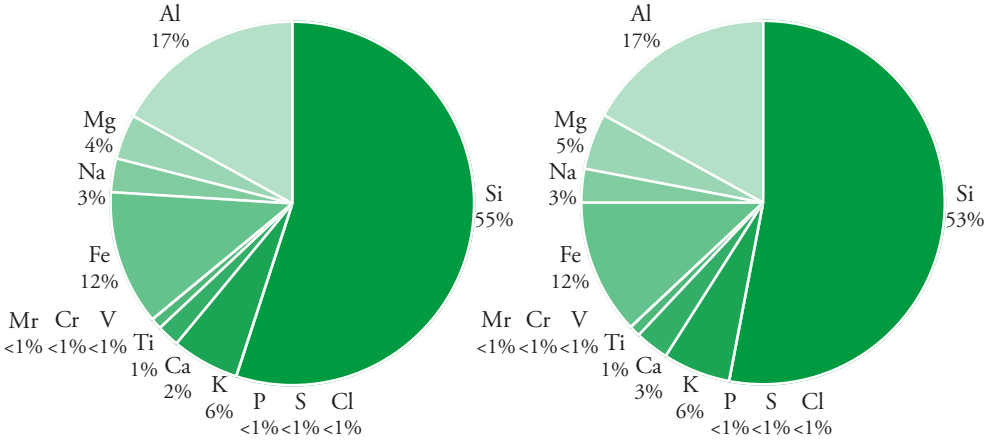
END OF LIFE STAGE
Expanded clay can be reused or recycled when a building or a infrastructure is demolished.
Expanded clay is disposable as not hazardous waste.

COMPONENTS

The average chemical composition of the expanded clay assessed by this EPD is shown in the pie chart, attaching also the average chemical composition of the raw clay.

In addition, to provide a complete overview of the connected production process, the average input flows and the average energy consumption are briefly described and summarized in the tables below, pointing out the relative percentages.
Clay is the main raw material, it is extracted from the property quarry and it is characterized by 10.41% moisture content.
Water is added to the mixture during the pre-processing phase and to the gas treatment.
All the internal recycled by-products, including dusts, sludge and recycled water, are added to the mixture during the pre-processing phase.
Dolomite and magnesian lime, finely pulverized, are injected during the cooking process.
Mixture of waste are used as wall water for the rotatory kiln.
Exhausted emulsions are used as oil in flame and are the main fuel of the rotatory kiln.
Electricity is the fuel that power the whole production process.
Natural gas is used in the gas treatment and for the boiler of heavy fuel oil.
Hydrated lime, soda (30%) and sulfuric acid (30%) are added in the gas treatment.

Chemical composition respectively of raw clay and expanded clay.



AVERAGE INPUT FLOWS [kg]		
Primary raw material	Clay	68,34 %
Additional raw materials	Water	22,31 %
	Dolomite	0,99 %
	Magnesia lime	0,17 %
	Materials for gas treatment as Hydrated lime, Soda, Sulfuric acid	1,11 %
Internal recycled	By-Product as Dusts, Sludge, Recycled water	7,08 %
		100%

AVERAGE ENERGY CONSUMPTION [kWh]		
Fuels	Electricity	9,48 %
	Natural gas	20,64 %
Secondary energy	Exhausted emulsions (65% flame oil)	58,59 %
	Mixture of waste (5% flame oil)	11,29 %
		100%

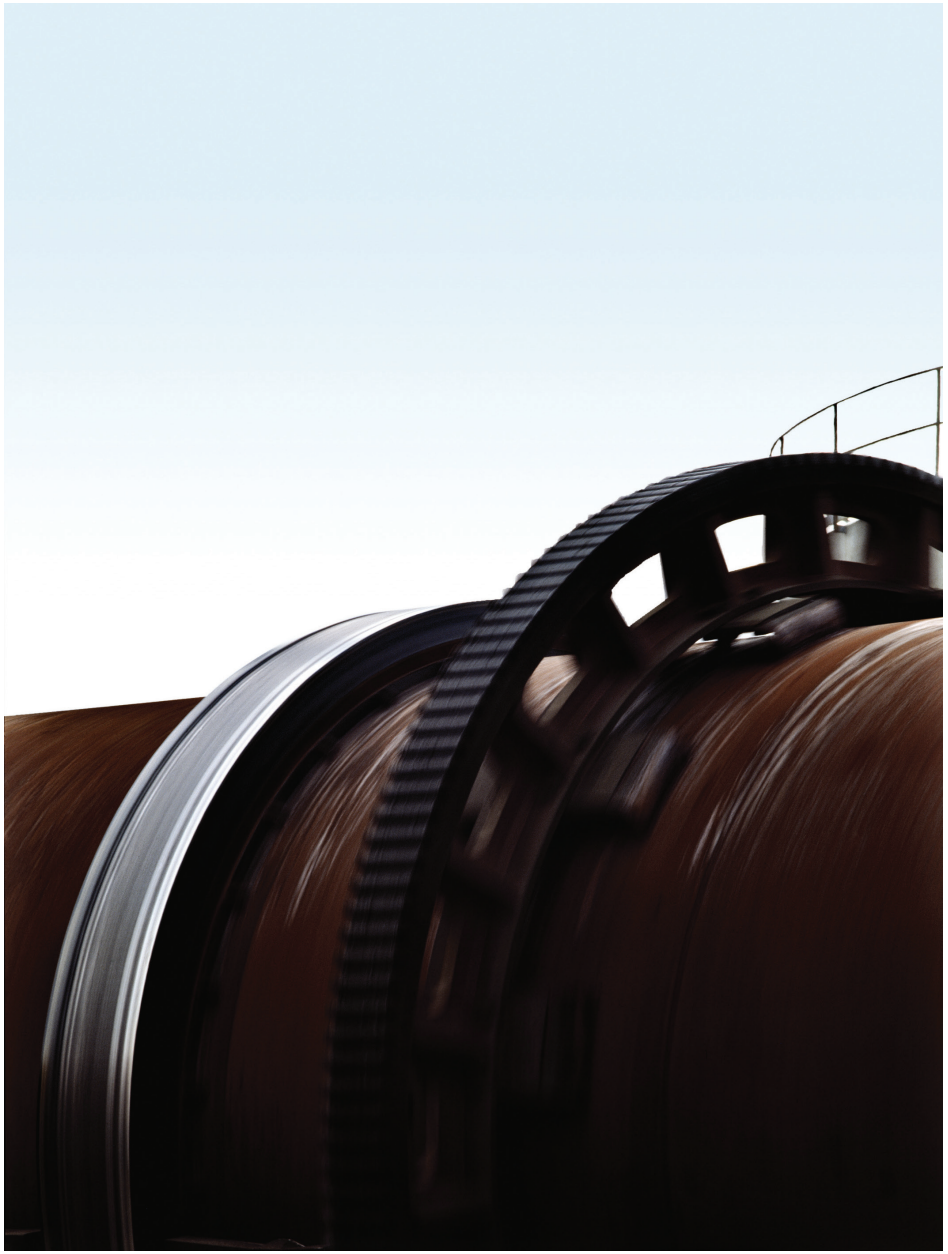
ENVIRONMENTAL IMPACTS

The results of the underlying LCA is presented in terms of environmental impacts, resource use, output flows and waste for the phases A1-A3.

STRUCTURAL TOUT VENANT

ENVI-RONMENTAL IMPACT	A1 - A3			Units
	Raw materials	Transport	Manufacturing	
GWP	8,89E+01			[kg CO_2-Eq.]
ODP	1,06E-05			[kg CFC11-Eq.]
AP	2,38E-01			[kg SO_2-Eq.]
EP	6,33E-02			[kg $(PO_4)^3$-Eq.]
POCP	1,34E-02			[kg ethene-Eq.]
ADPE	3,64E-05			[kg Sb-Eq.]
ADPF	1,16E+03			[MJ]

GWP = Global warming potential
ODP = Depletion potential of the stratospheric ozone layer
AP = Acidification potential of land and water
EP = Eutrophication potential
POCP = Formation potential of tropospheric ozone photochemical oxidants
ADPE = Abiotic depletion potential for non-fossil resources
ADPF = Abiotic depletion potential for fossil resources



STRUCTURAL TOUT VENANT

RESOURCE USE	A1 - A3			Units
	Raw materials	Transport	Manufacturing	
PERE	8,76E+01			[MJ]
PERM	0,00E+00			[MJ]
PERT	8,76E+01			[MJ]
PENRE	1,22E+03			[MJ]
PENRM	0,00E+00			[MJ]
PENRT	1,22E+03			[MJ]
SM	0,00E+00			[kg]
RSF	0,00E+00			[MJ]
NRSF	1,55 E+03			[MJ]
FW	9,11E-01			[m^3]

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 = Use of net fresh water

SPECIFICATIONS RELATED TO USE OF NON-RENEWABLE SECONDARY FUELS

The Laterlite production plant of Rubbiano (Parma, Italy) assessed in this EPD is defined as co-incinerator, because it burns waste (exhausted emulsions) in place of fossil fuels to generate energy for powering its own production process. This use of energy from waste is declared (based on the net calorific value) under the heading “Use of secondary fuel”, as required by CEN/TR 16970 Standard, since a more appropriate indicator currently does not exist.

STRUCTURAL TOUT VENANT

OUTPUT FLOWS AND WASTE	A1 - A3			Units
	Raw materials	Transport	Manufacturing	
HWD	1,70E-03			[kg]
NHWD	3,95E+00			[kg]
RWD	3,06E-03			[kg]
CRU	0,00E+00			[kg]
MFR	0,00E+00			[kg]
MER	0,00E+00			[kg]
EEE	0,00E+00			[MJ]
EET	0,00E+00			[MJ]

HWD = Hazardous waste disposed
NHWD = Non-hazardous waste disposed
RWD = Radioactive waste disposed
CRU = Components for re-use
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported electrical energy
EET = Exported thermal energy

CALCULATION RULES

DECLARED UNIT

1 m³ of loose expanded clay aggregate in bulk (so called "structural Tout Venant") with a density of 700 kg/m³ and a grading of 0-15 mm.
The results are presented for structural Tout Venant expanded clay in grading 0/15 mm (loose bulk), considering the range with the average granulometry and the average density (typical loose bulk density of structural Tout Venant range depending on grain size 620 – 720 kg/m³).
Since the production process is the same, it is possible to have the EPD results for the products with different grading. Conversions into other grading and loose bulk densities can be performed by using the factor in the tables attached.

PRODUCT [mm]	DENSITY [kg/m³]	FACTOR
0-5	720	1.03
4-16	620	0.89
0-15	700	1

ASSUMPTIONS

This EPD is intended to represent one product (structural Tout Venant) that is produced in one manufacturing plant (Rubbiano) with different granulometries. The system boundaries include the mandatory modules A1-A3, as required by Standard EN 15804, applying therefore a "from cradle to gate" approach. During the LCA study, assumptions were avoided as much as possible, collecting primary data from the manufacturing plant in question. All the phases related to raw materials production and manufacturing have been considered, from raw materials extraction to their production. In particular, primary data were sources for the clay extraction and transportation within the cave, having available the type of machines adopted and the related number of work hours. It is acknowledged that the consumption of oils and greases for the machine maintenance have been taken into account. In case of transport, all those related to raw materials supply, maintenance materials, additives and waste produced have been considered, accounting the type of machines employed and the distance traveled. With reference to the electricity consumption, it was modeled using the average Italian energy mix.

CUT OFF RULES

All the inputs and outputs data within the product system boundary are included in the LCA calculation. Consumptions and emissions were taken into account only if referred to the production process, excluding the contributions related to the heating of offices. Production of capital equipment, machinery and infrastructure were not included in the assessment as they present long-term life cycle and maintenance operations; however, they were considered when characterized by short-term replacement cycles (for example, refractory and insulation materials).

DATA QUALITY

Tout Venant expanded clay products were described by using primary data coming from Laterlite S.p.A. manufacturing plant placed in via Vittorio Veneto 30, Rubbiano di Solignano (Parma, Italy) and are referred to 2016 production (166.295.394 t of expanded clay). Customized LCA questionnaires were used to gather in-depth information about all aspects of the production system (for example, raw materials contents and specifications, pre-treatments, process efficiencies, air and water emissions, waste management), in order to provide a complete picture of the environmental burden of the system from Raw materials supply (A1) to Transport (A2) and Manufacturing (A3).

ALLOCATIONS

Allocation was avoided whenever possible. Since Rubbiano production plant produces standard Tout Venant and structural Tout Venant, specific data has been gathered for both types of product to calculate the related impacts. When it was not possible to avoid allocation, it was done on mass basis by distributing the total inputs and outputs from the production in 2016 to the total weight of produced Tout Venant expanded clay. This concerns electricity, maintenance materials for production systems, transports, as well as waste from the production, water emissions and isolated air emissions contributions.

SYSTEM BOUNDARIES

CRADLE TO GATE

The system boundary of the EPD follows the modular structure in line with EN 15804. This section describes the modules, which are contained within the scope of this study. As the scope of the assessment is limited to cradle to gate of the manufacturing process, only modules A1-A3 have been considered in this LCA.

Broad scheme of expanded clay production, in which the main activities included in the system boundaries are listed and divided in the three production modules: Raw materials supply, Transport and Manufacturing.

A1 - Raw materials supply	**A2** - Transport	**A3** - Manufacturing
Clay extraction	Clay transportation	Mixing and lamination process
Raw materials sourcing	Raw materials transportation	Drying and cooking process
Water sourcing	Maintenance materials transportation	Gas treatment process
Fuels and electricity generation		Cooling process
Maintenance materials sourcing		Sieving process
		Crushing process
		Deposit of clay

A1 - RAW MATERIALS SUPPLY

The module examines and assesses the impacts generated by the extraction and processing of clay as primary raw material and the supplying of the other raw materials used throughout the production cycle.

A1 - Raw materials supply | **A2** - Transport | **A3** - Manufacturing

Clay extraction from the clay pit by Laterlite S.p.A.

Raw materials sourcing used for the cooking process and the gas treatment process: dolomite, calcium hydroxide, soda, sulfuric acid, magnesia lime.

Water sourcing used for the dough process and the gas treatment process.

Energy for the production process: electricity and natural gas.

Maintenance materials for production system.

Scheme of the considered system boundaries (module A1).

A2 - TRANSPORT

The module examines and assesses the impacts generated by the transportation of raw materials and secondary raw materials from their place of origin to the Rubbiano manufacturing plant.

A1 - Raw materials supply | **A2** - Transport | **A3** - Manufacturing

Clay transportation from clay pit to production plant.

Raw materials transportation from production or collection facilities to production plant.

Maintenance materials transportation for production system.

A3 - MANUFACTURING

The module examines and assesses all the production processes for the manufacture of the expanded clay within the Rubbiano manufacturing plant.

A1 - Raw materials supply | **A2** - Transport | **A3** - Manufacturing

Mixing process of the clay with heavy fuel oil, water and by-products of the internal recycling (water, sludge and dusts) and lamination process.

Drying and cooking process in a rotary klin with dolomite and magnesia lime, using as fuels the natural gas and the industrial waste of exhausted oils and emulsions.

Gas treatment process and RTO (Regenerator Thermal Oxidizer) with calcium hydroxide, soda and sulfuric acid.

Cooling process with countercurrent air flow.

Sieving process for the selection of the different grading.

Crushing process of the grain size not suitable for sale.

Deposit of clay in piles intended for sale.

ADDITIONAL INFORMATION

AGENCY ENVIRONMENTAL CERTIFICATION

Management system: ISO 14001:2015 and OHSAS 18001:2007 certified.
The expanded clay industry is committed to continuously reducing the impact of production and developing the properties and applications of the material to improve its sustainability. Expanded clay is produced with the maximum care for employees, environment, climate, neighborhood and local communities. Over the last few decades, the industry has considerably reduced both its energy consumption and CO_2 emissions.

TECHNICAL RULES OF THE PRODUCT

Placing on the market/Technical rules of the product:
Regulation (EU) No 305/2011 and its amendments.
Product standards: EN 13055; EN 14063-1; EN 15732.

REFERENCE SERVICE LIFE

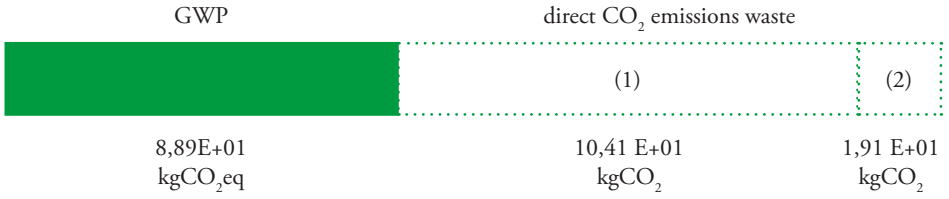
The durability of expanded clay is usually equal to the useful life of the building in which it is used. In any case it is more than 50 years.

SPECIFICATIONS RELATED TO RECYCLING

Compared to the traditional production plant, Laterlite production plant of Rubbiano (assessed in this EPD and authorized as co-incinerator) has the advantage of using exhausted emulsions as energy (65% flame oil, 35% water) and mixture of waste as wall water (5% flame oil, 95% water), bringing environmental benefits. Indeed, it recovers the waste conferred by third parties and reuses them within the production process in the form of exhausted emulsions. In this way, it avoids the use of fossil fuels for heat production and exploits the energy derived from the combustion process, thus contributing to a circular economy.
In addition, Rubbiano production plant carries out internal recycling processes of by-products, i.e. water and sludge collected from the washing tower, sludge from settling tanks, dusts from the gas treatment process and dusts from operation of yard cleaning. All the listed by-products are reinserted in the process within the clay mixture, decreasing therefore the use of raw materials.

SPECIFICATIONS RELATED TO GWP

In the calculation of GWP indicator, the direct CO_2 emissions generated by the combustion of waste (exhausted emulsions) at the plant were not considered, due to the application of the "polluter pays" principle, following the indication provided in Table 2 by CEN/TR 16970 Standard. Indeed, the Standard claims that when the waste is legally defined as waste and used as substitute for primary fuels, the environmental impacts from waste processing (e.g. incineration) must be declared by the system that generate waste and they must not be declared by the system that use the waste. According to this principle, in the production process (and co-incineration) of Rubbiano plant, the direct CO_2 emissions generated by the combustion of waste are not included in the assessment. In fact, Rubbiano plant represents the disposer, with the advantage of producing from combustion the energy used for the production process, avoiding thus the combustion of fossil fuels and the connected impacts related to supply, transformation and transport.
Note that the removal has been applied only for direct CO_2 emissions, since no data are available to estimate the direct emissions linked to other polluting substances emitted into air during the combustion of waste. Consequently, compared to the other environmental impact indicators, there is probably an overestimation of the impacts generated.
The amount of CO_2 directly emitted by the plant for the combustion of waste (exhausted emulsions) is disclosed in this section as additional information. The calculation of CO_2 emissions is based on the emission factors defined by Eco Chimica Romana on the basis of statistical calculation of samples taken from Rubbiano plant for exhausted emulsion (1) and on the basis of oil emission assumption for the 5% of mixture of waste (2).



DANGEROUS SUBSTANCES

None of the following substances have been added to the product: Substances on the REACH Candidate list of substances of very high concern and substances that lead to the product being classified as hazardous waste.
Due to the very high temperatures during the production process, expanded clay do not contain any organic substances.