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BC MATERIALS

CLAY PLASTER

ISSUED 12.09.2025
VALID UNTIL 12.09.2030

THIRD PARTY VERIFIED
in accordance with EN 15804+A2
and B-EPD PCR

FUNCTIONAL UNIT AND MODULES DECLARED
To cover 1 m² of indoor wall in 10 mm layer with a lifetime of 100 years in Belgium

A123	A4	A5	B	C	D
•	•	•	•	•	•

The intended use of this EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings. This EPD is only valid when registered on www.b-epd.be. The FPS Public Health cannot be held responsible for the information provided by the owner of the EPD.

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1 PRODUCT DESCRIPTION

1.1 Product name

Léém Clay Plaster, CP-PL_b

1.2 Product description and intended use

The Léém Clay Plaster from BC Materials is a Belgian product used as cover on interior wall. It is constituted of secondary resource as Loam or Brussels sand. The product is sold as a powder.

This EPD is specific to the BC Materials enterprise and corresponds to only one site of production.

The product is used as base layer coat and rough finishing coat for interior walls. This product is suitable for damp rooms but must not be applied to areas in direct contact with water.
It is suitable for single layer from 6 to 15 mm plastering of uneven, rough, flat substrates such as masonry, reed mats, stone mesh, cement or lime or gypsum plasters, concrete and various types of board material.

1.3 Reference flow / declared unit

The declared unit is defined as “To cover 1 m² of indoor wall in 10 mm layer with a lifetime of 100 years, in Belgium”.
The lifetime is 100 years.

Packaging is included.
The weight per reference flow is 17 kg.
The density of the product is 1800 kg / m³.

1.4 Installation

Material for fixation and installation are included. This EPD includes the impacts of all processes, fixating materials, jointing materials or treatments necessary for installing the product.

The Clay Plaster is mixed with water using a mortar mixer and is then manually applied on the wall using usual tools as trowel board, plant sprayer, stainless steel trowel, etc. Preparation of Clay Plaster is shown below.

A variant can also be mentioned, where 0.5% of weight of straw fibre is added during the installation phase.

Detailed information on this scenario can be found in the chapter “Details of the underlying scenario’s”.

1.5 Composition and content

Components	Composition / content / ingredients	Quantity
Product	– Brown Clay Plaster – – – Straw fibres (variant)	- 10.2 kg/m² for 6 mm thickness - 17 kg/m² for 10 mm thickness - 25 kg/m² for 15 mm thickness *0.5% w/w of the plaster*
Fixation materials	- Water	20% w/w of the plaster
Jointing materials	– Not relevant	
Treatments	– Not relevant	
Packaging	– Big bag for large content on a EUR Pallet (1 tonne or 0.5 tonne capacity)	- 93.9% for big bag of 1 tonne - 6.1% for big bag of 0.5 tonne

The Brown Clay plaster is composed of Loess loam, Brusseliaan sand, Rhine sand and Dordogne clay. First both raw materials are secondary resources and represent more than 65% in weight of the product.

The product does not contain materials listed in the “Candidate list of Substances of Very High Concern for authorization”.

1.6 Reference service life

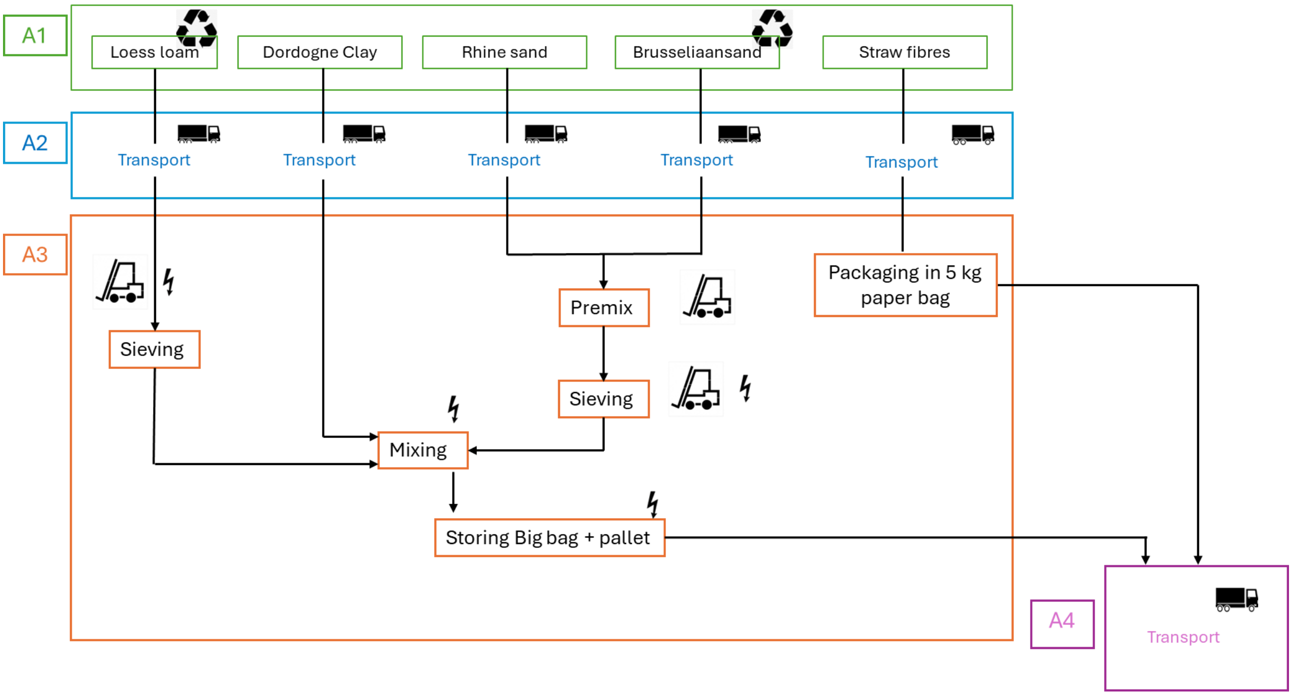
The reference service life is estimated at 100 years.
The RSL is based on the guidelines outlined in Sustainability of Construction Works – Environmental Product Declarations for Earthen Building Materials – General Rules for the Creation of Type III Environmental Product Declarations (Nachhaltigkeit von Bauwerken – Umweltproduktdeklarationen für Lehmbaustoffe – Allgemeine Regeln für die Erstellung von Typ III Umweltproduktdeklarationen), Section 3.2.1.3.
The conditions under which this RSL is valid are as following: normal use of plaster which has been correctly installed.

1.7 Description of geographical representativity

Clay Plaster is produced in Brussels, Belgium.
Data for this LCA are representative and relevant for this specific production.
Primary data inventory of described processes is representative of the BC materials product.
Installation (A4-A5), end-of-life (C) and benefits (D) are representative of Belgian practices. This study is in accordance with time, geography and technology compliance.
This study is representative of the Belgian market.

1.8 Description of the production process and technology

The production of Clay Plaster is performed in Brussels with the following process.
First, the primary and secondary resources come to the production site by truck. The secondary resource Loess loam is sieved. Then, the secondary resource Brusseliaan sand is mixed with the dried rhine sand. Once mixed, the sand premix (Brussels sand and dried sand) are sieved.
The next step is the mixing of both Loess loam and sand premix at which stage the bentonite is also added. After mixing, the final product is obtained and goes to the packaging step where Clay Plaster is stored in a big bag containing 1 tonne or 500 kg of product. Concerning straw fibres, material comes by grouped truck transport to BC Materials in plastic bags of 23 kg capacity. Straw is then packaged manually in a paper bag of 5 kg.
Figure below presents the schema of Clay Plaster production from steps A1 to A4.



This Belgian EPD considers the production of Clay Plaster, packaged in a big bag and installed with or without straw.

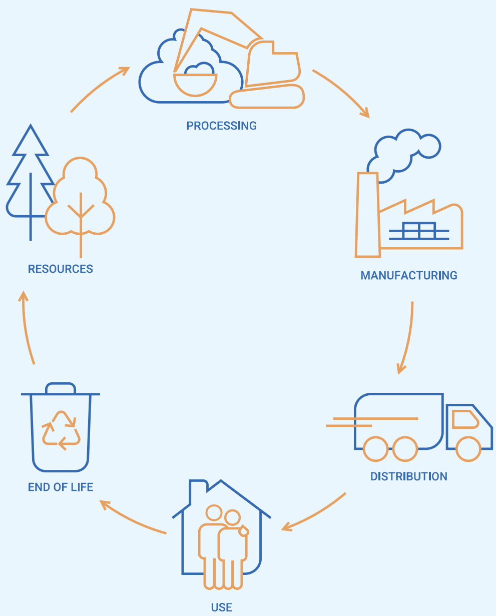
2 TECHNICAL DATA / PHYSICAL CHARACTERISTICS

Technical property	Standard	Value	Unit	Comment
Thickness		6 – 15	mm	6, 10 or 15 mm of thickness
Density class	DIN18947	1800	kg/m³	
Strength class	DIN18947	SII		
Compressive strength	DIN18947	1,5	N/mm²	
Flexion strength	DIN18947	0.7	N/mm²	
Adhesive strength	DIN18947	0.1	N/mm²	
Abrasion	DIN18947	≤0.7	g	
Impact diameter	EN520	<15	mm	
Water vapor diffusion number μ	DIN18947	5/10		
Thermal conductivity λ	DIN18947	0.9	W/m²K	
Fire reaction	DIN18947	A1		Non flammable

3 LCA-STUDY

3.1 Date of LCA-study

LCA has been performed from June 2024 to November 2024 and reviewed in November-December 2024.



3.2 Software

For the calculation of the LCA results, the software program Open LCA v2.2.0. has been used.

3.3 Information on allocation

Mass allocation has been used to model secondary resources included in the product (Loam and Brussels sand) as well as for the modelling of module D.
Secondary resources are free of environmental burden due to their waste status.

3.4 Information on cut off

Concerning cut-off, the EN15084+A2 rule has been applied: "In case of insufficient input data, or data gaps for a unit process, the cut-off criteria shall be 1% of renewable, 1% of non-renewable primary energy usage, 1% of the total mass input of that unit process".
Furthermore, the EN 15804+A2 claims: "The total of neglected input flows per module, e.g. per module A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and module D shall be a maximum of 5 % of energy usage and mass. Conservative assumptions in combination with plausibility considerations and expert judgement can be used to demonstrate compliance with these criteria."

Installation losses are very low and based on the German PCR of Earth Plaster, are neglected and then cut off.

Water needed during the installation is neglected. Indeed, the water is not used for chemical transformation but for physical transformation. This water evaporates into the air after 1 week at 20°C and 50% RH. This is neglected in accordance with the German PCR of Earth Plaster (paragraph 4.3).

Another cut off is also the charges and benefits of paper in module D for paper bag packaging (from straw).
Except for direct infrastructure in the operational site, all flows of mass and energy have been taken into account.

3.5 Information on excluded processes

Following processes were excluded for the inventory:

- Employee transport and business travel
- Energy use, infrastructure and consumables from administrative departments (e.g. head offices and sales offices)
- Lighting, heating and cleaning of production sites, Consumables necessary for the functioning of the process (e.g. lubricating oil),
- Production, maintenance and end-of-life of equipment.

3.6 Information on biogenic carbon modelling

The product does not contain any biogenic carbon. The only biogenic carbon present in this scenario is the one included in the wood pallet (linked with the big bag).
The variant product, where straw fibres are added, contains also biogenic carbon.
Globally, the biogenic carbon content is calculated according to the following formula:
kg C/UF = C content of component (kg C/kg) x quantity of component per UF (kg/UF) x characterization factor (+/-1)
The Carbon to CO_2 conversion is performed by multiplying the C content by the molar ratio of the two components: 44/12 = 3.667.
Straw contains biogenic carbon stored during growth through photosynthesis. The quantity of carbon dioxide captured during growth is taken from the Phyllis 2 database (Phyllis2 - ECN Phyllis classification) is equal to 0.3910 kg C per kg of straw with 15%wt of moisture (from the Ecoinvent database).
One functional unit based on the market (1.06% of straw in installed area) contains 9.01E-4 kg of straw. For the market, the quantity of CO_2 captured thanks to the straw is equal to 1.29E-3 $kgCO_2$/UF.
Concerning packaging, there is also biogenic carbon:

- Wood pallet: the quantity of carbon dioxide captured by wood is evaluated using the generic estimate for wood-based products of approximately 0.5 kg C/kg or 1.83 $kgCO_2$/kg.

– For 1 FU (market based): 1.80E-2 x 1.83 = 3.3E-2 kg CO_2/UF.

Other packaging component does not contain biogenic carbon.

	Biogenic carbon content (kg C/FU)
Biogenic carbon content of the product (at factory gate)	3.52E-04kg C/FU
Biogenic carbon content of packaging (at factory gate)	9.01E-03 kg C/FU

3.7 Information on carbon offsetting

Carbon offsetting is not allowed in the EN 15804+A2 and hence not taken into account in the calculations. BC Materials does not take any carbon offsetting.

3.8 Information on carbonation of cementitious materials

There are no cementitious materials in our scenario, nor in the production step or in the installation step.

3.9 Additional or deviating characterisation factors

For the CEN indicators all CF are conform to EN 15804+A2:2019 with EF 3.1 for normalization and weighting step.
The characterization factors from EC-JRC were applied. No additional or deviating characterisation factors were used.

3.10 Description of the variability

This EPD is not an average EPD hence no variability is declared.

3.11 Specificity

The data used for the LCA are specific for this product which is manufactured by a single manufacturer BC Materials in a single production site in Brussels (including mentioned operational site as Eurakor).

3.12 Period of data collection

Manufacturer specific data have been collected for the year 2023.

3.13 Information on data collection

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Inventory data for the clay plaster production, its installation, its packaging as well as annex consumptions are primary data given by BC Materials.
The declared value is based on the market and is representative of the average in terms of variant (with straw) and of packaging (big bag of 1 tonne with 93.1%, 500 kg with 6% or a paper bag with 0.9%).

3.14 Database used for background data

Background data come from Ecoinvent 3.10.
Accordingly to the EN 15804:2012+A2:2019 standard and the BE-PCR, when generic data from Ecoinvent V3 are used, the model of “allocation, cut-off by classification” is used.
Date of update : Ecoinvent v3.10 – June 2024

3.15 Energy mix

The Belgian residual mix in the background process in Ecoinvent V3.10 corresponds to 2020. It is used as it is.

Origin of energy	%
Nuclear	34,3%
Natural gas	19,2%
Imports	14,5%
Wind	13,3%
Hydro	1,4%
Photovoltaics	10,4%
Waste	2,5%
Biomass	2,6%
Oil	0,0%
Other	1,8%

4 PRODUCTION SITES

The production site is in BC Materials, Brussels, Belgium. Another location of packaging only for paper bags is at Eurakor, Leuze en Hainaut, Belgium.

5 SYSTEM BOUNDARIES

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
☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

X = included in the EPD
☐ = module not declared

ADD A CLEAR DESCRIPTION OF THE SYSTEM BOUNDARIES, WITH SPECIAL ATTENTION FOR COPRODUCTS, EOW, WASTE PROCESSING, INPUT OF RECOVERED RAW MATERIALS, ...

6 POTENTIAL ENVIRONMENTAL IMPACTS PER REFERENCE FLOW

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
GWP total (kg CO_2 equiv/FU)	3,22E-02	3,67E-01	1,15E-01	9,07E-02	5,93E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,50E-02	1,15E-01	1,59E-02	5,32E-03	-1,67E-01
GWP fossil (kg CO_2 equiv/FU)	3,21E-02	3,67E-01	1,40E-01	9,06E-02	3,39E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,50E-02	1,15E-01	1,58E-02	5,32E-03	-1,73E-01
GWP biogenic (kg CO_2 equiv/FU)	1,02E-05	2,54E-04	-2,53E-02	6,28E-05	2,54E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,91E-06	7,92E-05	1,36E-04	7,33E-07	5,91E-03
GWP luluc (kg CO_2 equiv/FU)	4,68E-05	1,22E-04	1,04E-04	3,01E-05	3,37E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,90E-06	3,78E-05	2,37E-05	2,74E-06	-7,23E-05
ODP (kg CFC 11 equiv/FU)	2,22E-09	7,29E-09	4,70E-09	1,80E-09	6,33E-11	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,88E-10	2,29E-09	4,37E-10	1,54E-10	-4,07E-09
AP (mol H+ eq/FU)	2,01E-04	7,64E-04	7,25E-04	1,89E-04	1,23E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,06E-04	3,15E-04	8,14E-05	3,77E-05	-5,10E-04
EP - freshwater (kg P- equiv/FU)	7,09E-06	2,49E-05	2,76E-05	6,14E-06	7,67E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,31E-06	7,72E-06	3,36E-06	4,41E-07	-1,38E-05
EP - marine (kg N- equiv/FU)	6,51E-05	1,86E-04	2,34E-04	4,59E-05	4,04E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,88E-04	9,84E-05	2,65E-05	1,44E-05	-1,55E-04
EP - terrestrial (mol N- equiv/FU)	7,61E-04	1,98E-03	2,49E-03	4,89E-04	3,88E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,06E-03	1,06E-03	2,83E-04	1,57E-04	-1,70E-03
POCP (kg Ethene equiv/FU)	2,07E-04	1,27E-03	9,05E-04	3,14E-04	1,06E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,15E-04	5,02E-04	8,84E-05	5,61E-05	-7,69E-04
ADP Elements (kg Sb equiv/FU)	2,08E-07	8,51E-07	4,12E-07	2,10E-07	8,27E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,21E-09	2,64E-07	1,12E-07	4,57E-09	-4,45E-07
ADP fossil fuels (MJ/FU)	4,49E-01	5,16E+00	2,90E+00	1,28E+00	4,19E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,88E-01	1,62E+00	4,18E-01	1,30E-01	-2,50E+00
WDP (m^3 water eq deprived /FU)	1,20E-02	2,90E-02	3,22E-02	7,17E-03	1,47E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,72E-03	9,03E-03	5,21E-03	5,80E-03	-1,72E-02

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)

7 RESOURCE USE

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
PERE (MJ/FU, net calorific value)	1,32E-01	8,86E-02	5,25E-01	2,19E-02	7,12E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,61E-03	2,75E-02	6,30E-02	1,21E-03	-1,72E-01
PERM (MJ/FU, net calorific value)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT (MJ/FU, net calorific value)	1,32E-01	8,86E-02	5,25E-01	2,19E-02	7,12E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,61E-03	2,75E-02	6,30E-02	1,21E-03	-1,72E-01
PENRE (MJ/FU, net calorific value)	4,62E-01	5,16E+00	2,90E+00	1,28E+00	4,19E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,88E-01	1,62E+00	4,18E-01	1,30E-01	-2,51E+00
PENRM (MJ/FU, net calorific value)	7,58E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,99E-06
PENRT (MJ/FU, net calorific value)	4,62E-01	5,16E+00	2,90E+00	1,28E+00	4,19E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,88E-01	1,62E+00	4,18E-01	1,30E-01	-2,51E+00
SM (kg/FU)	1,28E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF (MJ/FU, net calorific value)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF (MJ/FU, net calorific value)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW (m^3 water eq/FU)	2,97E-04	6,93E-04	7,78E-04	1,71E-04	3,43E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,82E-05	2,16E-04	1,27E-04	1,35E-04	-4,37E-04

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

8 WASTE CATEGORIES & OUTPUT FLOWS

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Hazardous waste disposed (kg/FU)	8,11E-04	5,12E-03	4,31E-03	1,27E-03	3,35E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,09E-04	1,59E-03	9,97E-04	9,72E-05	-2,59E-03
Non-hazardous waste disposed (kg/FU)	1,00E-02	5,67E-02	2,29E-01	1,40E-02	7,14E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,82E-03	1,76E-02	5,34E-03	1,41E-03	-2,86E-02
Radioactive waste disposed (kg/FU)	1,02E-06	1,66E-06	4,60E-06	4,11E-07	2,95E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,47E-08	5,17E-07	3,02E-06	2,03E-08	-2,10E-06
Components for re-use (kg/FU)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,60E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling (kg/FU)	2,73E-03	0,00E+00	2,53E-01	0,00E+00	1,44E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,62E+01	0,00E+00	0,00E+00
Materials for energy recovery (kg/FU)	1,44E-04	0,00E+00	0,00E+00	0,00E+00	1,96E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy (MJ/FU)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,27E-01

9 IMPACT CATEGORIES ADDITIONAL TO EN 15804

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
PM (disease incidence)	2,90E-09	2,16E-08	1,34E-08	5,34E-09	8,27E-11	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,14E-08	7,15E-09	1,51E-09	8,36E-10	-1,30E-08
IRHH (kg U235 eq/FU)	1,50E-03	6,69E-03	1,67E-02	1,65E-03	1,16E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,64E-04	2,08E-03	1,25E-02	8,31E-05	-7,62E-03
ETF (CTUe/FU)	4,74E-01	1,40E+00	9,64E-01	3,45E-01	1,47E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,30E-02	4,34E-01	1,33E-01	1,77E-02	-7,78E-01
HTCE (CTUh/FU)	1,20E-10	2,60E-09	4,95E-10	6,43E-10	1,12E-11	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,76E-10	8,07E-10	2,94E-10	2,40E-11	-1,15E-09
HTnCE (CTUh/FU)	3,12E-10	2,85E-09	8,21E-10	7,04E-10	6,92E-11	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,96E-11	8,88E-10	2,00E-10	2,01E-11	-1,31E-09
Land Use Related impacts (dimensionless)	1,26E+00	3,12E+00	2,82E+00	7,70E-01	1,10E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,14E-02	9,67E-01	1,73E+00	2,56E-01	-2,17E+00

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);

9.1 Environmental impact categories explained

Global Warming Potential

The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.

It is split up in 4:

- Global Warming Potential total (GWP-total) which is the sum of GWP-fossil, GWP-biogenic and GWP-luluc
- Global Warming Potential fossil fuels (GWP-fossil) : The global warming potential related to greenhouse gas (GHG) emissions to any media originating from the oxidation and/or reduction of fossil fuels by means of their transformation or degradation (e.g. combustion, digestion, landfilling, etc).
- Global Warming Potential biogenic (GWP-biogenic) : The global warming potential related to carbon emissions to air (CO2, CO and CH4) originating from the oxidation and/or reduction of aboveground biomass by means of its transformation or degradation (e.g. combustion, digestion, composting, landfilling) and CO2 uptake from the atmosphere through photosynthesis during biomass growth - i.e. corresponding to the carbon content of products, biofuels or above ground plant residues such as litter and dead wood.
- Global Warming Potential land use and land use change (GWP-luluc): The global warming potential related to carbon uptakes and emissions (CO2, CO and CH4) originating from carbon stock changes caused by land use change and land use. This sub-category includes biogenic carbon exchanges from deforestation, road construction or other soil activities (including soil carbon emissions).

Ozone Depletion

Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.

Acidification potential

Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.

Eutrophication potential

The potential to cause over-fertilization of water and soil, which can result in increased growth of biomass and following adverse effects.

It is split up in 3:

- Eutrophication potential - freshwater: The potential to cause over-fertilization of freshwater, which can result in increased growth of biomass and following adverse effects.
- Eutrophication potential - marine: The potential to cause over-fertilization of marine water, which can result in increased growth of biomass and following adverse effects.
- Eutrophication potential - terrestrial: The potential to cause over-fertilization of soil, which can result in increased growth of biomass and following adverse effects.

Photochemical ozone creation

Chemical reactions brought about by the light energy of the sun creating photochemical smog. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.

Abiotic depletion potential for non-fossil ressources

Consumption of non-renewable resources, thereby lowering their availability for future generations. Expressed in comparison to Antimonium (Sb).

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

Abiotic depletion potential for fossil ressources

Measure for the depletion of fossil fuels such as oil, natural gas, and coal. The stock of the fossil fuels is formed by the total amount of fossil fuels, expressed in Megajoules (MJ).

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

Ecotoxicity for aquatic fresh water	The impacts of chemical substances on ecosystems (freshwater). The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
Human toxicity (carcinogenic effects)	The impacts of chemical substances on human health via three parts of the environment: air, soil and water. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
Human toxicity (non-carcinogenic effects)	The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
Particulate matter	Accounts for the adverse health effects on human health caused by emissions of Particulate Matter (PM) and its precursors (NOx, SOx, NH3)
Resource depletion (water)	Accounts for water use related to local scarcity of water as freshwater is a scarce resource in some regions, while in others it is not. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
Ionizing radiation - human health effects	This impact category deals mainly with the eventual impact on human health of low dose ionizing radiation 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.
Land use related impacts	The indicator is the “soil quality index” which is the result of an aggregation of following four aspects: – Biotic production – Erosion resistance – Mechanical filtration – Groundwater The aggregation is done based on a JRC model. The four aspects are quantified through the LANCA model for land use. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

10 DETAILS OF THE UNDERLYING SCENARIOS USED TO CALCULATE THE IMPACTS

10.1 A1 - raw material supply

This module takes into account the extraction and processing of all raw materials and energy which occur upstream to the studied manufacturing process.

To produce brown clay plaster, four different raw materials are needed: Dordogne clay, Loess loam, Brusseliaansand and Rhine sand.
Straw fibres needed for the variant of the product is also taken into account. This variant represents 1.06% of the market. The amount of fibres in the final product is about 0.5% in weight.
Concerning the Brusseliaansand and the Loess loam which are excavated on construction sites, the assumption is that there is no impact to produce these raw materials, taken into account in the A1 module. Indeed, they are legally considered as waste (of a construction site) the moment they leave the construction site.
Loess leem, Brusseliaansand and dried sand are transported in bulk. This step is then equal to zero. Straw fibres and the Dordogne Clay are transported respectively in a plastic bag and in a paper bag.
For the modelling of Rhine sand, the MRPI-EPD called: "Zand 0-4, in en nabij Nederland, geproduceerd door Cascade-leden, A1-A3, cat. 2" has been used. The supplier is a member of Cascade.

10.2 A2 – transport to the manufacturer

The raw materials are transported to the manufacturing site.
Transportation of raw materials is achieved using trucks. Table below shows information about transport of raw materials with the origin, the distance and the database used to model it.

Resource	Origin	Distance
Brusseliaansand	Brussels, Belgium	10
Loess loam	Brussels, Belgium	/
Rhine sand	Barlo, Deutschland	290
Dordogne clay	Mazeyrolles, France	894
Straw fibre	Uithuizen, The Netherlands	380

For Loess loam, transportation from the demolition site to BC Materials is not considered. The supplier is an earth-mover who excavates from a construction site and delivers directly to BC materials, bypassing a Temporary Storage Centre. For Brusseliaansand, the resource is stored in All Belgium Recycling site (a Temporary Storage Centre), which is about 10 km away from BC Materials. This distance has been taken into account.
The type of lorry used is the one recommended by the BE-PCR for bulk materials. Concerning the range EURO, suppliers have confirmed their EURO6 certification for trucks and the Brussels region only allows EURO6 trucks on its territory starting from 1/1/2025.

10.3 A3 - manufacturing

This module takes into account the production process.
The first step is the sieving of the Loess loam. The goal is to reduce the granulometry of the loam, to obtain less than 6 mm. To do so, a wheel loader loads a conveyor belt that brings the loam to the flexsiever. Once sieved, the loam is conveyed using a conveyor belt and then a reach truck is used to displace the sieved loam. The wheel loader consumes diesel. For the remaining machinery or engine, all are using electricity. The global losses for this step are assumed to be equal to 1%.
Concerning the Brusseliaansand and the Rhine sand, they are mixed, using a wheel loader engine consuming diesel. This premix is then sieved using the same infrastructure as the loam. The losses are equal to 1.15%.
The final step is the mixing of the sieved loam, the sieved premix of Brusseliaansand and Rhine sand and finally the Dordogne clay. This step uses a mixer and a conveyer belt, both working with electricity.
After mixing, the product is stored on site and displaced to the storing place using an electric reach truck.
Concerning the final product, they are two different types of packaging: in big bag with a content of 500 kg or 1 tonne which is put on a pallet with a 25 cycles lifetime
Concerning the variant with straw fibres, these ones are only stored in BC Materials plant without any operation excepted a manually packaging in a paper bag of 204.4 g for 5 kg of straw to be delivered with the Clay Plaster and to be mixed on site by the product consumer in module A5.
All operations are performed using machinery using diesel or electricity. Data are based on data collection with calculated and measured data on site.

10.4 A4 – transport to the building site

For the transportation to the construction site, statistics from the sales department are available and used to model the average transport.
Transportation mode is road, and the used database is "transport, freight, lorry 16-32 metric ton, EURO6 | transport, freight, lorry 16-32 metric ton, EURO6 | Cutoff, U – RER". The classification EURO6 is based on information received from the suppliers.
The average distance has been calculated as 33 km. This is a weighted average of all sold Clay Plaster in 2023.
The capacity utilisation including empty returns is the one given by default, as 50%.

10.5 A5 – installation in the building

At the construction site, packaging materials are released. Based on the reversibility of the material and the German PCR for Earth product, no material losses have been taken into account in the installation phase. The percentage of 0.02% is below the cut off rule. Water is not taken into account as consumption, because it is not used for chemical transformation but for physical transformation. This water evaporates into the air after 1 week at 20°C and 50% RH. Based on the German PCR, this water has been neglected.

Parts of the installation	quantity	Description
Processes necessary for the installation of the product - electricity	*2.55E-03 kWh*	ELECTRICITY NEEDED FOR THE MIXING OF THE PRODUCT WITH WATER
Fixation materials - Water	*3.4 kg*	WATER
Jointing materials	*Not relevant*	/
Treatments	*Not relevant*	/
Material losses	*0%*	DUE TO ITS REVERSIBILITY, DUST OF MATERIAL CAN BE RECOVERED AND REINTRODUCED IN THE PRODUCT
Packaging		BIG BAG FOR LARGE CONTENT ON A EUR PALLET (1 TONNE OR 0.5 TONNE CAPACITY) PAPER BAG FOR STRAW

There is no ancillary materials for installation.
Concerning the end-of-life of packaging, default scenarios have been used and are presented in table below.

Nature of packaging	Scenario	%	Ecoinvent database
Paper/cardboard	Incineration	5	treatment of waste paperboard, municipal incineration | waste paperboard | Cutoff, U - GLO
	Recycling	95	Burdens/benefits out of boundaries
Pallet	Incineration	40	treatment of waste wood, untreated, municipal incineration | waste wood, untreated | Cutoff, U - GLO
	Recycling	40	Burdens and benefits out of boundaries (see module D)
	Reuse	20	Benefits out of boundaries
Big bag	Landfill	5	treatment of waste polypropylene, sanitary landfill | waste polypropylene | Cutoff, U - RoW
	Incineration	60	treatment of waste polypropylene, municipal incineration | waste polypropylene | Cutoff, U - GLO
	Recycling	35	Burdens and benefits out of boundaries (see module D)

Transportation of waste is also taken into account according to the default values of BE-PCR:

- Transportation from the construction site to sorting plant: 30 km
- Transportation from sorting plant to landfill: 50 km
- Transportation from sorting facility to incineration plant/energy recovery: 100 km

The transportation mode is 100% with Lorry 16-32 ton (EURO 5).
The loads and benefits coming from the paper sack packaging are not taken into account, assumed to be under the cut off rule due to the low amount of this type of packaging in the average market.
Loads and benefits from the pallet and the big bags end-of-life scenarios are included in module D.

10.6 B – use stage (excluding potential savings)

There is no operation of maintenance or replacement, nor use of water or energy during the lifetime of the plaster.

10.7 C: End of life

A specific scenario for the Clay Plaster could be modelled with the recovery of the product by making use of the reversible binding qualities of clay without loss of quality. The product can be easily separated from the wall (some support substrates will need the applied Clay Plaster to be wettened beforehand). The recuperated mix is air – dried if needed and has the exact same composition and unaltered chemistry as the initial product.
When Clay Plaster is wetted before demolition, no particulate matter is emitted, and hence this parameter is zero.
A take back program for the Leem Clay Plaster is in place, recommended in the public guide "General guide: Building sustainably with Léém" of use for this product and consists of the recovering of the product as mentioned previously. As a principle, the reversibility of clay and the implementation of a resulting take back program is mentioned in the German PCR for Clay Plaster chapter 8.1 .
The proportion between the take back program, and the base scenario is assumed to be:

- 40% of the product recovered by the take back program
- 55% of the product recycled
- 5% of the product landfilled

Concerning the recycling, the finish layer follows the same path as its substrate (e.g. concrete, brick). During grinding, the finishing layer is recycled with the debris. The layer can then replace inert materials.
C1: Demolition
The demolition of plaster is associated with the demolition of the wall. This module takes into account the diesel consumption of the machines for the demolition (0.044 MJ/kg) as well as particulate matter emissions. This step is applied on 60% of the product. The product entering the take back program is obtained directly.

C2: Transport to waste processing
Concerning the transport of waste, the generic transport distances have been used:

- From construction/demolition site to sorting plant/crusher/collection point: 30 km
- From sorting plant to landfill: 50 km

For the product recovered by the take back program, the product is sent back to BC materials site. The average transportation is then used with 33 km. For the take back program, a lorry 16-32 tonnes, EURO 6 has been used.
For the remaining waste going to the sorting plant, and to the landfill, the default transporting mode is used with a lorry 16-32 tonnes, EURO 5.
C3: Waste processing for reuse, recovery and/or recycling
The amount of waste going to the sorting plant is about 60% of the global waste which represent the product recycled and the product landfilled.
Concerning the sorting plant, it has a crusher and then a consumption of 0,0037 kWh of Belgian electricity per kg of crushed product has been used.
To charge and discharge waste, a diesel consumption of 5,9 MJ burned in building machine is assumed for 1 cubic meter of bulk waste (density of 1400 kg/m^3 and the bulk density of waste can be calculated as 0.9 x material density).
To take the infrastructure of sorting plant into account, a factor of 10^{-10} plant per kg of waste has been used.
C4: Waste processing for reuse, recovery and/or recycling
Concerning the disposal, waste is assumed to be put in a landfill for inert waste.
Parameters of used scenarios are presented in Table below.

End of life modules – C3 and C4	Unit	Value
Wastes collected separately	kg	6.8
Waste collected as mixed construction waste	kg	10.2
Waste for re-use	kg	6.8
Waste for recycling	kg	9.35
Waste for energy recovery	kg	0
Waste for final disposal	kg	0.85

10.8 D – Benefits and loads beyond the system boundaries

Module D is calculated in accordance with EN 15804:2012+A2:2019. All declared net profits and expenses resulting from net flows leaving the system of products that have not been assigned as co-products and have reached end-of-waste status, are included in this end-of-waste status, are included in this module D (reuse, recycling, energy recovery).
The benefits come from the reuse, recycling and energy valorisation of packaging waste (see A5 for more details) but also from the reuse and recycling of Earth plaster.
The BE-PCR default values are applied.
The benefits out of boundaries are the following:

- Reuse
    - Plaster (C4): 6.8 kg/FU which are substituted new product. The benefits are calculated as the environmental impacts of the production of Leem Clay Plaster (from A1 to A3) without packaging
    - Pallets (A5): 6.01E-04 kg/FU which substitutes new pallet
- Recycling

- Plaster (C4): 9.35 kg/FU. To avoid double benefits of the use of secondary resources, only the percentage of the primary raw materials will be taken into account. They represent 31.8% of the weight of the product.
  - Pallets (A5): 1.20E-03 kg/FU which substitutes wood chips.
  - Big bag (A5): 7.21E-03 kg/FU which substitutes polypropylene plastic.
- Energy recovery
  - Pallet (A5): 1.20E-03 kg/FU. The lower heating value of a pallet of 30% of humidity is about 12.24 MJ/kg. A specific cogeneration plant is modelled (Valbiom) with an electric yield of 22% and a thermal efficiency of 50%.
  - Big bag (A5): 1.24E-04 kg/FU. The incinerated fraction leads to a cogeneration with default efficiency of 10% for electricity and 20% for the thermal energy. The LHV of the polypropylene is equal to 44 MJ/kg.

– Total electricity substitution is equal to 5.76E-02 MJ/FU or 1.60E-02 kWh/FU. Thermal substitution is about 1.16E-01 MJ/FU.

The loads out of boundaries are the following:

- Shredding of pallet (A5): 1.20E-03 kg/FU related to the wood chips substitution.
- Plastic sorting and recycling.
- Transportation to the recycling plant for plastics: 138 km (from the Ecoinvent database: “market for transport, freight, lorry, unspecified | transport, freight, lorry, unspecified | Cutoff, U – RER”)
- Transportation to the shredding plant of pallet: 64 km (from the Ecoinvent database: “market for waste wood, post-consumer | waste wood, post-consumer | Cutoff, U”)

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

11.1 Indoor air

VOC emissions have been assessed in accordance with EN16516 and are below the lowest threshold. This means no indoor air problems.

11.2 Soil and water

The contact with water is reduced. Indeed, the product in a wall should not be in contact with water during this lifetime, except to be recovered. Then, the emissions of substances potentially problematic is not relevant.

12 DEMONSTRATION OF VERIFICATION

EN 15804+A2 serves as the core PCR

Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010
Internal ☐ External ☒

Third party verifier: Agnes Schuurmans & Bob Roijen, SGS INTRON B.V., Dr. Nolenslaan 126, 6136 GV Sittard, the Netherlands, bob.roijen@sgs.com

13 LCA INTERPRETATION

This study has shown the low environmental impact of product coming from earth as a resource, especially when using secondary resources such as Brussels sand and Loess loam coming from excavations of construction sites.
This study has also shown the importance of the take back program that implies a reuse of the components and then savings of resources and energy. The take back program is already in place but this type of element is quite new on the market and there are few experiences about demolition of buildings including this product. Indeed, the starting point of the use of this component is less old than the lifetime of the buildings where they are involved. However, a take back program as a defining principle of earth building materials is also mentioned in the German PCR for Clay Plaster (see German PKR for Clay Plasters chapter 8 *Nachnutzungsphase).*
The take back program is possible thanks to the reversibility of the product. Indeed, its reversible binding qualities of clay without loss of quality allows that the product can be easily separated from the wall (some support substrates will need the applied Clay Plaster to be wettened beforehand). The recuperated mix is air – dried if needed and has the exact same composition and unaltered chemistry as the initial product (See German PKR for Clay Plasters chapter 8.1)

14 TECHNICAL INFORMATION FOR SCENARIO DEVELOPMENT

This B-EPD is relative to a layer of Clay Plaster of 10 mm. Other thickness can be applied with 6 mm or 15mm. Due to the same density, a proportional rule can be applied. Results are proportional to the thickness.

15 APPLICATION UNIT

The functional unit is defined as “To cover 1 m² of indoor wall in 10 mm layer with a lifetime of 100 years, in Belgium”.
To fulfil this, 17 kg of product is needed. This study is performed for the Clay Plaster “as installed”. This functional unit is in accordance with the TOTEM program and represents the sold average product. These results can be used for a product applied with or without straw and packaged in a big bag.

Other thickness of 6 mm and 15 mm can be extrapolated from the table of results from 10 mm. Environmental impacts are proportional with the thickness.

16 ADDITIONAL INFORMATION ON REVERSIBILITY

Description	Type of fixing	Level of reversibility	Simplicity of disassembly	Speed of disassembly	Ease of handling (size and weight)	Robustness of material (material resistance to disassembly)	Comment
Interior layer covering an interior wall.	Water activates the reversible clay binder which creates reversible adhesion to the support.	Reversible connection (See German PKR for clay plasters Chapter 8)	simple – use of trowels and water if needed.	Speedy disassembly	easy to handle manually, one worker is usually sufficient	The material resists well during disassembly, there is no loss of quality.	The recuperated mix is air – dried if needed and has the exact same composition and unaltered chemistry as the initial product.

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General information

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Polygones
Rising Sustainable Economy

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Date of verification: 19.08.2025
External independent verification of the declaration and data according to EN ISO 14025 and relevant PCR documents

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