ENVIRONMENTAL
AND HEALTH DECLARATION SHEET (FDES)

In compliance with EN 15804+A2 and its national supplement NF EN 15804 + A2/CN
In compliance with ISO 14025

Lime/Hemp concrete manufactured on site.

(timber frame not included)

Thickness 30 cm

Chaux de Saint Astier - CSA

Registration number: 20240437874
Publication date: 30/05/2024
Version 1

Warning

French regulations:
In France, an environmental declaration (notice disclosing environmental aspects) has been mandatory for producer-to-consumer marketing of products intended for the construction industry.
Declarations must be compliant with standards NF EN 15804+A2 and NF EN 15804/CN, applied over the entire life cycle, and are called Environmental and Health Declaration Sheet (FDES).
FDES ≈ EPD on full life cycle (EN 15804+A2)+health information (NF EN 15804+A2/CN)
These FDES provide information about the product's entire life cycle, as well as additional health-related information and have been integrated into the INIES database (www.inies.fr).

Foreword:
The information contained in this declaration is provided under the responsibility of Chaux de Saint Astier (CSA) in accordance with EN 15804+A2 and the national supplement NF EN 15804 + A2 /CN.

Any use, total or partial, of the information provided in this document must at least be accompanied by a full reference to the original FDES and to its producer, who will be able to provide a complete copy.

Please note that the results of the study are based solely on the facts, circumstances and assumptions submitted during the course of the study. If these facts, circumstances and assumptions differ, the results may change.

Furthermore , the results of the study should be considered as a whole, in the light of the assumptions made, and not taken individually.

CEN standard EN 15804+A2 is used as the Product Category Definition Rules (PCR) (October 2019).

Reading guide

The display of inventory data meets the requirements of EN 15804+A2.
In the following tables 2.53E-06 should be read: $2.53x10^{-6}$ (scientific writing).

The units used are specified in front of each flow:
- the kilogram "kg",
- the gram "g",
- litre "l",
- the kilowatt-hour "kWh",
- the megajoule "MJ"

Abbreviations :
- LCA : Life Cycle Assessment
- RSL : Reference service life
- FU : Functional Unit
- LHV : Lower Heat Value

How to use the FDES to compare products

Construction product FDES may not be comparable if they do not comply with EN 15804+A2.
The EN 15804+A2 standard defines in *§ 5.3 Comparability of construction products*, the conditions under which construction products can be compared, on the basis of the information provided by the FDES:
"A comparison of the environmental performance of construction products using EPD information must be based on the use of the products and their impacts on the building, and must take into account the entire life cycle (all information modules)."

CONTENTS

INTRODUCTION

The framework used to present the environmental product declaration is based on the national supplement NF EN 15804+A2/CN.
This data sheet provides a suitable framework for presenting the environmental characteristics of construction products in accordance with the requirements of standard EN 15804+A2, its national supplement NF EN 15804+A2/CN, and for providing comments and useful additional information in keeping with the spirit of this standard in terms of sincerity and transparency.

The information contained in this declaration is provided under the responsibility of Chaux de Saint Astier (CSA), owner of the declaration. This declaration is valid for the sole production site of Chaux de CSA located in Saint Astier (24), France.

The declaration was made by: Karibati l'expertise du bâtiment biosourcé contact: Marion Chirat (m.chirat@karibati.com).

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CHAUX de SAINT-ASTIER® : l'Excellence pour la Vie

1 GENERAL INFORMATION

1. Name and address of declarant

The owner of the declaration is the company "Chaux de Saint Astier" located : Lieu dit la Jarthe, 24110 Saint Astier. France

2. FDES representation

This FDES is valid for lime/hemp concrete produced with Batichanvre® Chaux de Saint Astier (Saint Astier 24110).

3. Commercial reference

Lime/hemp concrete is made with Batichanvre® and hemp hurd (trade name ISOCANNA®).

4. Type of ESDS

This individual FDES covers the "cradle-to-grave" stages. Module D is included.

5. Distribution channels

This FDES is intended for B2B and/or B2C communication.

6. Expiry date :

This FDES was published in May, 2024 and is valid for 5 years.

7. Verification :

Program operator: INIES database
http:/www.inies.fr/
Since 2011, the HQE association has been acting as owner-manager of the building.
INIES database. (Association HQE: 4, avenue du Recteur Poincaré 75016 PARIS).

NF EN 15804+A2 (October 2019) and NF EN 15804+A2/CN (October 2022) serve as RCP standards [a]
Independent external verification of declaration and data in accordance with EN ISO 14025:2010.
Third-party verification[b] : **Mr. Clément Bolle,** WeLOOP 254 rue du bourg, 59130 Lambersart , France Tel: +33 7 81857682 Email: c.bolle@weloop.org Website: www.weloop.org
[a] Rules for defining product categories. [b] Optional for business-to-business communication, mandatory for business-to-customer communication (see EN ISO 14025:2010, 9.4).
INIES registration number: **20240437874**
Date of 1ère publication: 30/05/2024

2 FUNCTIONAL UNIT AND PRODUCT DESCRIPTION

1. Functional unit description :

" Ensure a distributed insulation function, using hemp concrete over 1m² of wall for a total thickness of 300 mm with an apparent density of approximately 350 kg/m³ (dry), i.e. a thermal resistance R = 4.11 m².K/W. Any implementation aids such as a secondary wooden frame are not taken into account in the FU.
The lifespan of the material is taken equal to 100 years"

2. Product description :

The product studied here is a lime/hemp concrete made from a combination of hemp hurd (shives) ISOCANNA® and BATICHANVRE® (CSA binder).

The term "hemp concrete" designates the mixture of a "vegetal aggregate", hemp hurd (from the grinding of the hemp stalk), a binder and water. Hempcrete is not a load-bearing material..

3. Description of product use

Lime/Hemp concrete is made and implemented on site by spraying, or by pouring (form).

Lime/Hemp concrete for wall application must be implemented according to the French Professional Rules. The aforementioned lime/hemp couple has been mechanically tested and fulfils the requirements of those professional rules.

Hemp concrete is used as a filling material within a main structure (timber or concrete) and it acts as a thermal insulator.

For more information, a technical guide is published by Chaux de Saint-Astier.

https://www.saint-astier.com/app/uploads/2022/07/ASTIER-DOC-CHAUX-CHANVRE.pdf

Main performance of the functional unit :

Lime/Hemp concrete has a density of approximately 350 kg/m³ and provides a thermal insulation with a thermal conductivity (λ) of 0.073 W/m.K. Or a thermal resistance (R) of 4.11 K.m²/W for a 30 cm thickness.

4. Masses and basic data for calculating the functional unit

Parameter	Units	Value
Product quantity	kg/FU	Density: 350 kg/m³ Batichanvre ®: 75 Isocanna® : 30
Quantity of complementary products (during implementation)	kg/FU	Water: 84
Distribution packaging	kg/FU	For the binder, use of kraft bags with plastic lining and a capacity of 25kg : - Kraft paper: 0.42 - PE film: 0.102 - Palette: 0.0085 u/FU For hemp hurd, use of PE bags with a capacity of 20 kg. 21 bags per pallet. - PE film: 0.266 - Palette: 0.00975 u/FU These bags are disposed after implementation.
Losses during installation	%	<1%
Justification of information provided		Information supplied by Chaux de Saint Astier (CSA)

5. Substances on REACH candidate list (if greater than 0.1% by mass)

The product does not contain any products on the REACH candidate list.

6. Description of reference lifetime (if applicable and in accordance with §7.2.2 of EN 15804+A2)

Parameters	Values
Reference service life	100 years old.
Declared product properties and finishes, etc.	30 cm thick Lime/Hemp concrete has a thermal resistance of 4.11 m².K/W.
Theoretical application parameters including references to appropriate practices	Lime/Hemp concrete must be implemented in accordance with the Professional standards for Hemp Construction (RP2C) The quality of the work is presumed to comply with the manufacturer's recommendations and professional standards. The product can be used anywhere in mainland France taking into account the manufacturer's instructions and professional standards.
Presumed quality of work when installation complies with manufacturer's instructions	
Outdoor environment (for outdoor applications)	
Indoor environment (for indoor applications)	
Terms of use	
Maintenance	

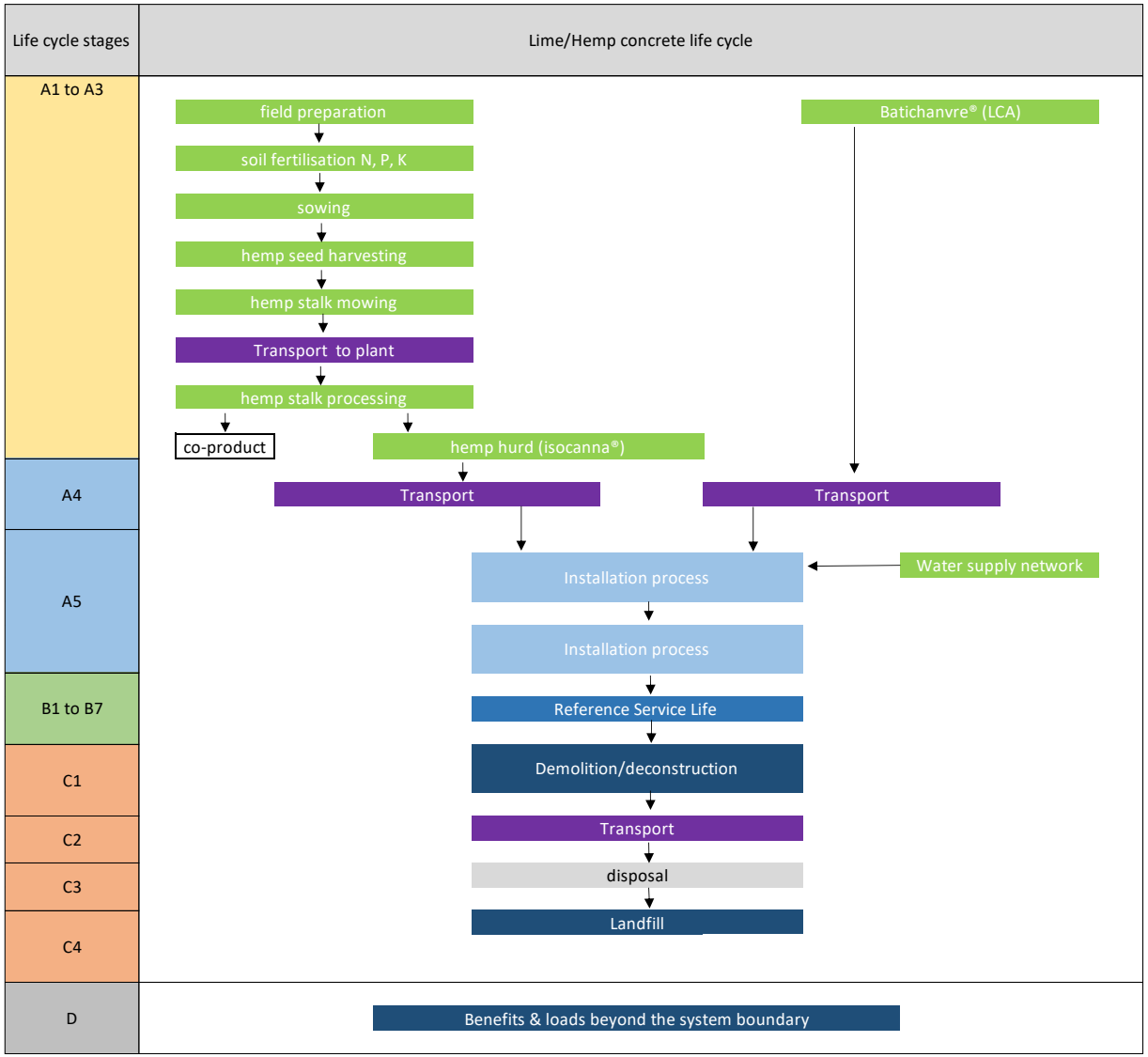
7. Information on biogenic carbon content

The binder packaging, made of kraft paper, and the pallet store biogenic carbon.

Biogenic carbon content	Unit	Values
Biogenic carbon content of product (ex-works)	kg.C/FU	13,5
Biogenic carbon content of associated packaging (ex works)	Kg.C/FU	0,21

3 LIFECYCLE STAGES

The product life cycle is shown below:



Production stage	production process stage		Life stage in use							End-of-life stage				Benefits and costs beyond system boundaries
Product	Transport	Construction / Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Use of energy	Water usage	Deconstruction / Demolition	Transport	Waste processing	diposal	Possibility of reuse, recovery, recycling
A1 - A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

1. Production stage, A1-A3

MODULE A1: Raw materials

All constituents of lime/hemp concrete are taken into account at this stage:

For ISOCANNA® hemp hurds:

- all agricultural actions ahead of obtaining hemp stalk,
- Transportation from the field to the hemp transformation plant,
- processing of the hemp stalk to obtain hemp hurd: Hemp is processed on a defibration line producing three co-products: hemp hurd, fibre and dust. Allocations were recorded for these three co-products and in particular for hemp as part of this study.
- Conditioning.

For BATICHANVRE® (Chaux de Saint-Astier) binder:

- Supply of the raw materials constituent of the binder,
- Formulation and blending,
- Packaging and storage;

The modelisation integrates all real source data, such as energy consumption, consumables, packaging and product maintenance, as well as the production of waste intended for treatment or recovery. All associated transport has been accounted for.

MODULE A2: Raw material transportation

The hemp hurd is transported from the hemp transformation plant to the Chaux de Saint-Astier site.

MODULE A3: Manufacturing

There are no manufacturing steps for this FDES.

1. Construction stage A4-A5

Module A4: Transport to the job site

The hemp hurd and the binder are transported together directly from Chaux de Saint-Astier to distributors or construction sites.

They are loaded onto flatbed-type semi-trailers.

For on-site supply :

Parameter	Value
Type of vehicle for transporting hemp hurd	16 to 32 T EURO 6 truck
Delivery distance to lime merchants	325 km
Type of vehicle for transport to site (lime & hemp)	16 to 32 T EURO 6 truck
Delivery distance to site (lime)	325 km

Module A5: Installation process

Lime/Hemp concrete is implemented directly on site.
The different constituents are mixed in a specialised machine then projected onto a vertical support.
Any implementation aids such as a secondary wooden frame are not taken into account in the FU.

Parameter	Value
Water consumption for processing	84 l/FU
Energy consumption and type for processing	(80%) Diesel: mortar (mixer + processing equipment) 14,98 kWh/m^3 of lime/hemp concrete. (20%) Electricity: 2,065 kWh/m^3 of lime/hemp concrete
Product packaging waste from the processing stage	Batichanvre® bags: 0,42 kg/FU Isocanna® : 0,25 kg/FU Pallets (Batichanvre® & Isocanna®): 4.55.10-3 kg/FU The end-of-life scenario for packaging waste (kraft paper) is based on a French scenario derived from Ecoinvent data. The scenario for pallets follows the one defined by CODIFAB in 2022 for wood products.
Losses during installation	<1 %
Direct emissions into ambient air, soil and water	None

2. Use stage B1-B7

Module B1: Use of the installed product

The product has no impact on this stage, as no maintenance is required during its working life.

On the other hand, during its working life, lime/hemp concrete will carbonate. Carbon dioxide present in the atmosphere penetrates the concrete from the surface of the material. This is a chemical process whereby carbon dioxide from the ambient air reacts with the $Ca(0H)_2$ contained in the lime mortar.

The quantity absorbed is linked to the amount of reactive CaO present in the lime. It is calculated in accordance with the recommendations of standard NF EN 16757 (June 2017) "Contribution of construction works to sustainable development - Environmental product declarations - Rules governing the product category for concrete and concrete elements".
In the case of this FDES, the strength of the concrete is Less than 15 MPa and this concrete is intended for buildings.

The k factor used here are :
- outside protected from rain 11
- inside covered by a render 11,6

Exterior : The lime/hemp concrete will be carbonated to a thickness of 110 mm after 100 years.
CO2 absorption will reach 11.4 kgCO2/m² during the operational life (carbonation rate at 75%).

Interior : The hemp concrete will be carbonated to a thickness of 116 mm after 100 years.
CO2 absorption will reach 6.4 kgCO2/m² during the operational life (carbonation rate at 40%).

Modules B2 to B7: Maintenance / repair / replacement / refurbishment/ energy use / water use

Under normal conditions of use, lime concrete requires no repair, maintenance, water or energy during its life cycle.

3. End-of-life stage C1-C4 :

Before it can be processed at the end of its life, it must first be recovered from the building. This operation is carried out using "chisel" type tools in the case of demolition.

The amount of electrical energy associated with this method is included in the study.

The scenario chosen for end-of-life treatment is :

- Landfill: 100 %

Parameter	Units	Value/description
Quantity collected separately	kg	0
Quantity collected with mixed construction waste	kg/FU	105
Quantity for reuse	%	0
Quantity for recycling	%	0
Quantity for energy recovery	%	0
Quantity of product landfilled	%	100
Transport distance to incineration site	km	0
Transport distance to landfill	km	30
Transport distance to sorting center for reuse	km	50

4. Benefits and load, D

Lime/Hemp concrete is entirely landfilled, so there is no recovery at the end of its life.

4 LIFE CYCLE ASSESSMENT CALCULATION INFORMATIONS

PCR used	EN 15804+A2 and NF EN 15804+A2/CN.
Cut-off rule	The cut-off rule used in this FDES is the one defined in EN 15804+A2.
System boundaries	System boundaries comply with the limits imposed by standard EN 15804+A2 and its national supplement NF EN 15804+A2/CN. The flows not taken into account are : - Construction of processing plants, including manufacturing machinery; - Workshop cleaning ; - Electricity consumption by administrative departments ; - Transportation of employees to the production site;
Allowances	An allocation on the impacts of upstream agriculture – divided between hemp seed and hemp stalk – has been calculated at A1 step. A second impact has been calculated at A3 step, at the level of the three co-products of hemp stalk : hemp hurd, fibre & dust. Allocations for end-of-life packaging waste (kraft paper) are based on a French scenario derived from Ecoinvent data. The scenario for pallets follows the one defined by CODIFAB in 2022 for wood. Other allocations from the database remain intact.
Quality of the main data used to produce the LCI - Specific data	Assessment of the quality of the main specific data shows a majority of data with an average rating of "very good" or "good". A few data received an "average" rating.
Quality of the main data used to produce the LCI - Generic data	Generic data received an average rating of "good".
Geographical and temporal representativeness of primary data	Software used:SimaPro life cycle analysis software (V9.3). The product in question is a French product, intended for the French market, and is representative of French lime/hemp concrete. Primary data was collected in 2023 from the hemp hurd producer supplying Chaux de Saint-Astier. The data transmitted is representative of production over one year. Secondary data comes from the Ecoinvent v3.8 (2021) database. Some agricultural data also comes from the Agribalyse database (v3.1, October 2022). The LCI for Batichanvre®, dating from the end of 2022 and modelled in NF EN 15804+A1 format, was used in inventory form (CSV format) for use in this EN 15804+A2 modeling. No data has been overlooked.
Biogenic carbon storage	To calculate biogenic carbon storage, the formula applied is : Quantity stored = [Quantity of CO2 stored in 1 kg of hemp * Quantity of hemp per FU]
Variability of results	Not applicable

5 LIFECYCLE ANALYSIS RESULTS

Below are the tables which summarize LCA. Results.
Due to rounding, totals may not equal the rounded sum.
For energy indicators used as raw materials: a negative value corresponds to the change in use from raw materials to fuel (in the case of incineration for example). Application of Appendix I of NF EN 15804+A2/CN.

Environmental impact	Production stage			Production process stage		Life stage in use							End-of-life stage				D Profits and expenses beyond system boundaries
	A1 Raw materials extraction	A2 Transport	A3 Manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy use	B7 Water use	C1 Deconstruction/ demolition	C2 Transport	C3 Waste treatment	C4 Disposal	
Climate change total kg CO_2 eq/FU	1,63E+01	3,15E+00	0,00E+00	2,97E+00	2,69E+00	-1,78E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,33E-01	5,14E-01	0,00E+00	4,43E+01	0,00E+00
Climate change - Fossil fuels kg CO_2 eq/-FU	6,22E+01	3,15E+00	0,00E+00	2,97E+00	1,61E+00	-1,78E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,30E-01	5,13E-01	0,00E+00	-7,36E-01	0,00E+00
Climate change - biogenic kg CO_2 eq/FU	-4,59E+01	2,72E-03	0,00E+00	3,01E-03	1,08E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,55E-03	4,43E-04	0,00E+00	4,50E+01	0,00E+00
Climate change - land use and land use change kg CO_2 eq/FU	1,15E-02	1,26E-03	0,00E+00	1,11E-03	1,26E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,04E-05	2,05E-04	0,00E+00	5,22E-04	0,00E+00
ozone Depletion kg CFC 11 eq/FU	4,22E-06	7,29E-07	0,00E+00	7,40E-07	2,57E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,37E-08	1,19E-07	0,00E+00	2,24E-07	0,00E+00
Acidification mol H^+ eq/-FU	1,86E-01	8,93E-03	0,00E+00	9,46E-03	1,25E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,81E-04	1,46E-03	0,00E+00	5,20E-03	0,00E+00

Aquatic Eutrophication, fresh water kg P eq/FU	7,58E-03	2,24E-05	0,00E+00	2,12E-05	4,25E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,05E-06	3,66E-06	0,00E+00	5,79E-06	0,00E+00
Marine aquatic eutrophication kg N eq/FU	6,34E-02	1,78E-03	0,00E+00	2,08E-03	5,54E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,26E-04	2,89E-04	0,00E+00	1,80E-03	0,00E+00
Terrestrial eutrophication mol N eq/FU	6,78E-01	1,98E-02	0,00E+00	2,31E-02	6,07E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,34E-03	3,23E-03	0,00E+00	1,98E-02	0,00E+00
Photochemical ozone formation kg NMVOC eq/FU	1,36E-01	7,61E-03	0,00E+00	9,11E-03	1,67E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,71E-04	1,24E-03	0,00E+00	5,76E-03	0,00E+00
Depletion of abiotic resources - fossil fuels MJ/FU	2,48E-04	1,12E-05	0,00E+00	7,10E-06	7,62E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,08E-06	1,82E-06	0,00E+00	1,26E-06	0,00E+00
Depletion of abiotic resources - minerals and metals kg Sb eq/FU	4,69E+02	4,77E+01	0,00E+00	4,83E+01	1,69E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,79E+01	7,78E+00	0,00E+00	1,54E+01	0,00E+00
Water requirements m3 depriv./FU	3,39E+00	1,45E-01	0,00E+00	1,66E-01	1,44E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,87E-02	2,37E-02	0,00E+00	6,95E-01	0,00E+00

environmental impacts	Production stage			Production process stage		Life stage in use							End-of-life stage				D Profits and expenses beyond system boundaries
	A1 Raw materials extraction	A2 Transport	A3 Manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy use	B7 Water use	C1 Deconstruction /demolition	C2 Transport	C3 Waste treatment	C4 Disposal	
Fine particle emissions disease index/FU	1,59E-06	2,53E-07	0,00E+00	3,44E-07	3,33E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,13E-09	4,12E-08	0,00E+00	1,05E-07	0,00E+00
Ionizing radiation, human health kBq U-235 eq/FU	2,43E+00	2,07E-01	0,00E+00	2,09E-01	7,63E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,80E-01	3,38E-02	0,00E+00	6,32E-02	0,00E+00
Exotoxicity (freshwater) CTUe/FU	1,20E+03	3,74E+01	0,00E+00	3,77E+01	9,99E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,26E+00	6,10E+00	0,00E+00	9,75E+00	0,00E+00
Human toxicity, carcinogenic effects CTUh/FU	4,48E-07	1,20E-09	0,00E+00	1,03E-09	5,16E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,51E-10	1,96E-10	0,00E+00	2,47E-10	0,00E+00
Human toxicity, non carcinogenic CTUh/FU	1,47E-06	3,78E-08	0,00E+00	3,97E-08	7,98E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,65E-09	6,17E-09	0,00E+00	6,42E-09	0,00E+00
Impacts of land use soil/soil quality MJ LHV/FU	3,06E+02	3,32E+01	0,00E+00	5,52E+01	2,27E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,94E-01	5,42E+00	0,00E+00	3,24E+01	0,00E+00

Resources use	Production stage			Production process stage		Life stage in use							End-of-life stage				D Profits and expenses beyond system boundaries
	A1 Raw materials extraction	A2 Transport	A3 Manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy use	B7 Water use	C1 Deconstruction /demolition	C2 Transport	C3 Waste treatment	C4 Disposal	
Use of renewable primary energy, excluding renewable primary energy resources used as raw materials MJ LHV/FU	3,14E+01	6,82E-01	0,00E+00	6,14E-01	2,37E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,45E+00	1,11E-01	0,00E+00	1,32E-01	0,00E+00
Use of renewable primary energy resources as raw materials MJ LHV/FU	5,20E+02	0,00E+00	0,00E+00	0,00E+00	-2,35E+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
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) MJ LHV/FU	5,52E+02	6,82E-01	0,00E+00	6,14E-01	2,31E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,45E+00	1,11E-01	0,00E+00	1,32E-01	0,00E+00
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials MJ LHV/FU	6,45E+02	4,80E+01	0,00E+00	4,86E+01	1,73E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,82E+01	7,83E+00	0,00E+00	1,55E+01	0,00E+00
Use of non-renewable primary energy resources as raw materials MJ LHV/FU	4,75E-01	0,00E+00	0,00E+00	0,00E+00	-4,75E-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
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) MJ LHV/FU	6,46E+02	4,80E+01	0,00E+00	4,86E+01	1,68E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,82E+01	7,83E+00	0,00E+00	1,55E+01	0,00E+00

Use of secondary materials kg/FU	1,18E+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
Use of renewable secondary fuels MJLHV/FU	3,22E+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
Use of non-renewable secondary fuels MJ LHV /FU	3,00E+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
Net freshwater use m^3/FU	1,61E-01	4,95E-03	0,00E+00	5,20E-03	8,54E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,24E-03	8,08E-04	0,00E+00	1,63E-02	0,00E+00

Waste category	Production stage			Production process stage		Life stage in use							End-of-life stage				D Profits and expenses beyond system boundaries
	A1 Raw materials extraction	A2 Transport	A3 Manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy use	B7 Water use	C1 Deconstruction/demolition	C2 Transport	C3 Waste treatment	C4 Disposal	
Hazardous waste disposed kg/FU	9,05E-01	3,50E-02	0,00E+00	3,34E-02	2,00E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,91E-03	5,70E-03	0,00E+00	1,05E-02	0,00E+00
Non-hazardous waste disposed kg/FU	1,75E+01	2,77E+00	0,00E+00	4,76E+00	3,16E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,20E-01	4,52E-01	0,00E+00	1,05E+02	0,00E+00
Radioactive waste disposed kg/FU	3,38E-03	3,22E-04	0,00E+00	3,27E-04	1,19E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,37E-04	5,26E-05	0,00E+00	1,01E-04	0,00E+00

Output flows		production stage			production process stage		Life stage in use							End-of-life stage				D Profits and expenses beyond system boundaries
		A1 Raw materials extraction	A2 Transport	A3 Manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy use	B7 Water use	C1 Deconstruction/ demolition	C2 Transport	C3 waste processing	C4 Disposal	
Components for reuse kg/FU		0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,13E-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
Materials for recycling kg/FU		3,17E-02	0,00E+00	0,00E+00	0,00E+00	3,98E-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
Materials for energy recovery kg/FU		4,65E-04	0,00E+00	0,00E+00	0,00E+00	2,16E-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
Energy supplied externally (by energy vector) MJ/-FU	Electricity	1,94E-02	0,00E+00	0,00E+00	0,00E+00	2,81E-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
	Steam	5,17E-03	0,00E+00	0,00E+00	0,00E+00	5,92E-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
	Process gas	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

Impact/flow category	Unit	Total Manufacturing	Total Implementation	Total Life cycle	Total End of life	Total Lifecycle
Climate change - total	kg CO_2 eq/FU	1,94E+01	5,67E+00	-1,78E+01	4,49E+01	5,22E+01
Climate change - fossil fuels	kg CO_2 eq/FU	6,53E+01	4,58E+00	-1,78E+01	-9,26E-02	5,20E+01
Climate change - biogenic	kg CO_2 eq/FU	-4,59E+01	1,09E+00	0,00E+00	4,50E+01	2,17E-01
Climate change - land use and land use change	kg CO_2 eq/FU	1,28E-02	1,24E-03	0,00E+00	8,08E-04	1,48E-02
Ozone Depletion	kg CFC11 eq/FU	4,95E-06	9,97E-07	0,00E+00	3,56E-07	6,31E-06
Acidification	mol H^+ eq/FU	1,95E-01	2,20E-02	0,00E+00	7,44E-03	2,24E-01
Aquatic eutrophication, freshwater	kg P eq/FU	7,60E-03	2,54E-05	0,00E+00	1,35E-05	7,64E-03
Marine aquatic eutrophication	kg N eq/FU	6,52E-02	7,62E-03	0,00E+00	2,21E-03	7,50E-02
Terrestrial Eutrophication	mol N eq/FU	6,98E-01	8,38E-02	0,00E+00	2,44E-02	8,06E-01
Photochemical ozone formation	kg NMVOC eq/FU	1,43E-01	2,58E-02	0,00E+00	7,37E-03	1,76E-01
Depletion of abiotic resources - minerals and metals	kg Sb eq/FU	5,17E+02	6,52E+01	0,00E+00	4,11E+01	6,23E+02
Depletion of abiotic resources - fossil fuels	MJ PCI/FU	2,59E-04	7,86E-06	0,00E+00	8,16E-06	2,76E-04
Water requirements	m^3 depriv. /FU	3,53E+00	3,10E-01	0,00E+00	7,68E-01	4,61E+00
Fine particle emissions	disease index/FU	1,84E-06	6,77E-07	0,00E+00	1,50E-07	2,67E-06
Ionizing radiation, human health	kBq U-235 eq/FU	2,64E+00	2,86E-01	0,00E+00	2,77E-01	3,20E+00
Exotoxicity (freshwater)	CTUe/FU	1,24E+03	4,77E+01	0,00E+00	2,11E+01	1,31E+03
Human toxicity, carcinogenic effects	CTUh/FU	4,49E-07	1,55E-09	0,00E+00	5,95E-10	4,51E-07
Human toxicity, non-carcinogenic effects	CTUh/FU	1,51E-06	4,77E-08	0,00E+00	1,62E-08	1,57E-06
Impacts of land use/soil quality	MJ LHV/FU	3,40E+02	5,75E+01	0,00E+00	3,86E+01	4,36E+02
Use of renewable primary energy, excluding renewable primary energy resources used as raw materials	MJ LHV/FU	3,20E+01	2,43E+01	0,00E+00	1,70E+00	5,80E+01
Use of renewable primary energy resources as raw materials	MJ LHV/FU	5,20E+02	-2,35E+01	0,00E+00	0,00E+00	4,97E+02
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ LHV/FU	5,52E+02	8,46E-01	0,00E+00	1,70E+00	5,55E+02
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials	MJ LHV/FU	6,93E+02	6,59E+01	0,00E+00	4,16E+01	8,01E+02
Use of non-renewable primary energy resources as raw materials	MJ LHV/FU	4,75E-01	-4,75E-01	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ LHV/FU	6,94E+02	6,55E+01	0,00E+00	4,16E+01	8,01E+02
Use of secondary materials	kg/FU	1,18E+00	0,00E+00	0,00E+00	0,00E+00	1,18E+00
Use of renewable secondary fuels	MJ LHV/FU	3,22E+01	0,00E+00	0,00E+00	0,00E+00	3,22E+01
Use of non-renewable secondary fuels	MJ LHV/FU	3,00E+01	0,00E+00	0,00E+00	0,00E+00	3,00E+01
Net freshwater use	m^3 /FU	1,66E-01	9,06E-02	0,00E+00	2,23E-02	2,79E-01
Hazardous waste disposed	kg/FU	9,40E-01	5,34E-02	0,00E+00	2,31E-02	1,02E+00
Non-hazardous waste disposed	kg/FU	2,02E+01	5,08E+00	0,00E+00	1,06E+02	1,31E+02
Radioactive waste disposed	kg/FU	3,70E-03	4,46E-04	0,00E+00	3,90E-04	4,54E-03
Components for reuse	kg/FU	0,00E+00	1,13E-02	0,00E+00	0,00E+00	1,13E-02
Materials for recycling	kg/FU	3,17E-02	3,98E-01	0,00E+00	0,00E+00	4,30E-01
Materials for energy recovery	kg/FU	4,65E-04	2,16E-01	0,00E+00	0,00E+00	2,16E-01
Energy supplied externally (electricity)	MJ/FU	1,94E-02	2,81E-01	0,00E+00	0,00E+00	3,00E-01
Energy supplied externally (steam)	MJ/FU	5,17E-03	5,92E-01	0,00E+00	0,00E+00	5,97E-01
Energy supplied externally (gas)	MJ/FU	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

6 ADDITIONAL INFORMATION ON THE RELEASE OF HAZARDOUS SUBSTANCES INTO INDOOR AIR, SOIL AND WATER DURING THE PERIOD OF USE

Indoor air :
The product is not in direct contact with indoor air.
The Batichanvre® used to make the concrete is certified Excell+.(CERTIFICATE No. 223-27767b) since June 2022.

Soil and water :
Not applicable, as this product does not come into contact with water intended for human consumption, runoff, seepage, groundwater or surface water.

7 PRODUCT CONTRIBUTION TO INDOOR QUALITY OF LIFE

Product characteristics contributing to the creation of hygrothermal comfort conditions in the building:

Due to its microstructure and its vapor permeability characteristics, the product contributes to better hygrothermal comfort in the building
Lime/Hemp concrete provides a distributed insulation function; it has a thermal conductivity $\lambda = 0.073$ W/m.K, i.e. a thermal resistance of 4.1 m^2.K/W for a thickness of 300mm.

Product features contributing to the creation of acoustic comfort conditions in the building :

Tests carried out by the CSTB / Acoustic Testing Division have shown that the product contributes to improving acoustic comfort. Test report no. AC19-26079429, available on request.

Product features contributing to the creation of visual comfort conditions in the building:
Not visible.

Product characteristics contributing to the creation of olfactory comfort conditions in the building:
The product is odourless.

BIBLIOGRAPHY

This EHSF is based on the following standard documents*:*
- AFNOR, *Norme NF EN ISO 14040, Analyse du cycle de vie / Principes et cadre*, Octobre 2006 ;
- AFNOR, *Norme NF EN ISO 14044, Analyse du cycle de vie / Exigences et lignes directrices*, Octobre 2006 ;
- AFNOR, *Norme EN 15804+A2, Contribution des ouvrages de construction au développement durable - Déclarations environnementales sur les produits - Règles régissant les catégories de produits de construction, Octobre 2019 ;*
- AFNOR*, Norme NF EN 15804+A2 /CN, Contribution des ouvrages de construction au développement durable - Déclarations environnementales sur les produits - Règles régissant les catégories de produits de construction - Complément national à l'EN 15804+A2, October 2022;*

An accompanying report describing the modeling and its main assumptions was submitted with the FDES for verification.