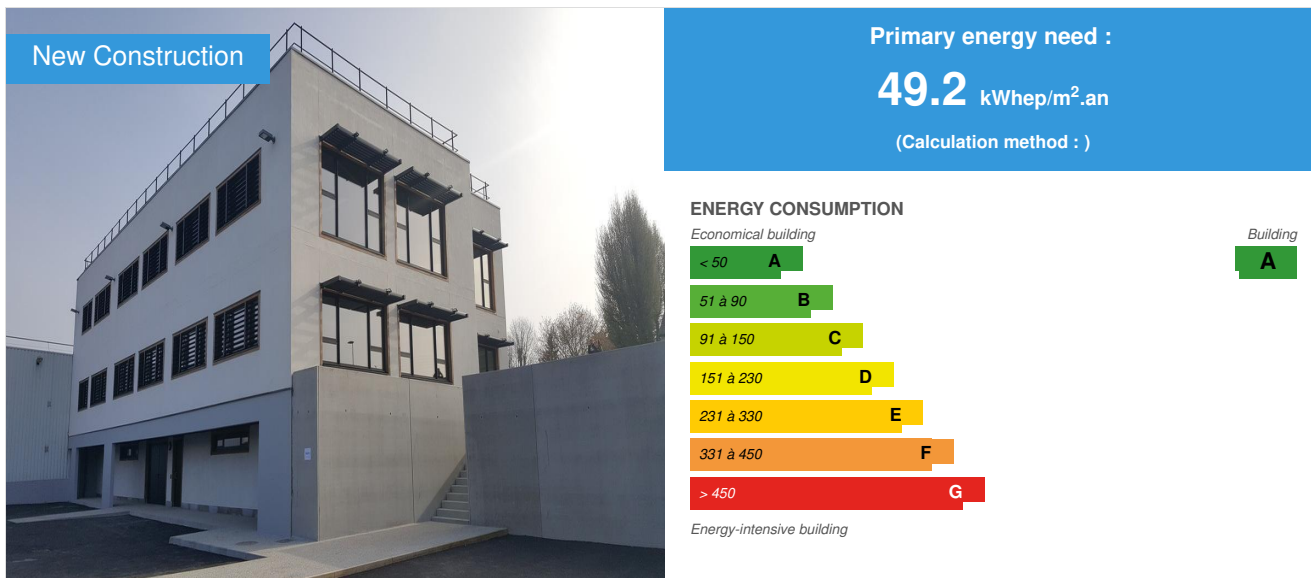


## Prefabricated wood-concrete hemp panel building - Triballat

by Margaux PETILLON / 2018-06-11 10:23:07 / France / 17630 / FR



**Building Type** : Office building < 28m  
**Construction Year** : 2017  
**Delivery year** : 2018  
**Address 1 - street** : 35530 NOYAL-SUR-VILAINE, France  
**Climate zone** : [Cfb] Marine Mild Winter, warm summer, no dry season.

**Net Floor Area** : 935 m<sup>2</sup>  
**Construction/refurbishment cost** : 1 620 000 €  
**Number of Work station** : 50 Work station  
**Cost/m<sup>2</sup>** : 1732.62 €/m<sup>2</sup>

**Certifications :**



### General information

The building is intended to receive the computer service of the company Triballat Noyal. Designed in the architectural style of the head office on the site, the book stands out for its eco-design, an echo of the owner's policy. The use of locally sourced biobased materials and bioclimatic design make it possible to register the building in a process of labeling low carbon building.

The building has been the subject of a constructive innovation: Creation of wood-concrete hemp panels.

### Sustainable development approach of the project owner

Triballat Noyal, dairy engaged in organic and vegetable, had the will to build a high-performance building and using bio-sourced materials and especially hemp,

plant which they exploit the seed for their food products. It is a way to enhance the agricultural sector as a whole and build a building that reflects their philosophy.

## Architectural description

The building takes the aesthetics of the seat on the same site and designed by Koutev agency.

The sobriety lies in the choice of simple and qualitative finishes. The white lime-sand plaster emphasizes the wooden window frames underlined by joineries and black sun breezes.

## See more details about this project

<http://can-ia.fr/batiment-bureau-triballat/>

## Stakeholders

### Contractor

Name : Triballat

Contact : MICHAUD Jean-Yves, jeanyves.michaud@triballat.com

<http://www.triballat.fr/>

### Construction Manager

Name : Can-ia

Contact : PICHON Quentin, quentin.pichon@can-ia.fr

<http://can-ia.fr/>

### Stakeholders

Function : Thermal consultancy agency

BIO BATENERGIE

contact@biobe.fr

<https://biobe.twiza.org/>

Thermal BE and environment

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Function : Company

Ets ANGEVIN

gregory.aubry@angevin.fr

<http://www.groupe-angevin.fr/>

Lot VRD & GO

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Function : Company

EURL LB ECO HABITAT / ACEIS

aceis@orange.fr || ellbeco@orange.fr

<http://www.aceis.fr/>

Lot of hemp concrete & int / ext finishes

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Function : Company

CMB

valentin.hachet@cmd-bois.fr

<https://cmb-bois.fr/>

Lot timber frame

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Function : Company

Ets Heriau

k.delmotte@heriaucouverture.fr

<http://heriaucouverture.fr/>

Lot Cover

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Function : Company

SAS BARON

contact@baron-menuiserie.fr

<http://www.baron-sas.fr/>

Lot Aluminum exterior carpentry & Locksmithing

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Function : Company

CMagencement

castelmenuiserie@wanadoo.fr

<http://www.cm-agencement.com/fr/accueil>

Lot Woodwork interior / exterior wood

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Function : Company

LANGLOIS SOBRETI

langlois@langloissobreti.fr

<http://www.langloissobreti.fr/>

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Function : Other consultancy agency

ARTELIA Passion & Solution

aurelie.blottiere@arteliagroup.com

<https://www.arteliagroup.com/fr/le-groupe/entreprise-responsable/performance-environnementale>

BBCA / E + C referent

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## Contracting method

Separate batches

## Type of market

Table 'c21\_luxembourg.rex\_market\_type' doesn't exist

## Energy

### Energy consumption

Primary energy need : 49,20 kWh/m<sup>2</sup>.an

Primary energy need for standard building : 96,40 kWh/m<sup>2</sup>.an

Calculation method :

Breakdown for energy consumption : • Heating: 28.1 kWh (ep) • Cooling: 0 kWh (ep) • ECS: 1.4 kWh (ep) • Lighting: 15.1 kWh (ep) • Auxiliary ventilation: 14.3 kWh (ep) • Auxiliary distribution: 0 kWh (ep)

### Real final energy consumption

Final Energy : 20,20 kWh/m<sup>2</sup>.an

### Envelope performance

Envelope U-Value : 0,72 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

The Building Envelope consists of a wood frame embedded in hemp concrete (integrated insulation) and improved with thermal insulation from the outside in rigid wood wool panels.

Indicator :

Air Tightness Value : 0,70

Users' control system opinion :

The airtightness is 0.7 at the intermediate test is better than what we had targeted in the study RT (0.92) and this value will probably come down for the final test. The RT study will therefore be retouched.

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### Systems

#### Heating system :

- Individual electric boiler

#### Hot water system :

- Individual electric boiler

#### Cooling system :

- No cooling system

#### Ventilation system :

- Double flow heat exchanger

#### Renewable systems :

- Solar photovoltaic

Renewable energy production : 16,47 %

#### Other information on HVAC :

- Individual electric heating
- Double flow central ventilation with heat exchanger
  
- 90 m<sup>2</sup> of photovoltaic panels on the roof, supplying the lighting and the C.T.A.

#### Solutions enhancing nature free gains :

- Élimination de la quasi-totalité des ponts thermique (ITE et isolation répartie), triple vitrage argons...

### Smart Building

#### BMS :

- The lighting is provided by LED bulbs. Beyond the presence of a manual switch, their brightness varies according to the solar input in the building through a home automation system using photoresistances.
- Solar breezes and solar caps are equipped with a home automation system allowing the inclination of the blades for the regulation of the solar gains in the offices.

## Environment

### Urban environment

Land plot area : 7 295,00 m<sup>2</sup>

Built-up area : 5,69 %

Green space : 921,10

The building is located in an ABF classified area. Its lime and zinc roofing give it a perfect coherence with the existing architecture.

## Products

### Product

Chènevotte (Hemp concrete)

Agro Chanvre

Agro Chanvre : Email: [contact@agrochanvre.com](mailto:contact@agrochanvre.com), Tel : 02 33 59 29 96 / 06 88 56 15 90

<https://www.agrochanvre-ecoconstruction.com/>

Product category : Second œuvre / Cloisons, isolation

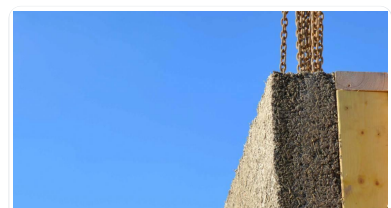
Among the bio-sourced materials, hemp needs to be better known. This plant growing without phytosanitary product and without irrigation is very useful for crop rotation. It is then fully recoverable:

its very nutritious seeds are processed for food and cosmetics

its fiber is used for textiles, paper or even bioplastics

the chènevotte, located at the heart of the stem, serves as mulch for horticulture and as granulate for agro-concrete.

Hemp concrete is a mixture of hemp, mineral binder and mixing water. This non-structural material is a very good hygro-thermal regulator, which brings both



insulation and inertia to the building, it functions as a monomasse.

Cost of hemp concrete per m<sup>2</sup> / ep200mm (excluding wood frame): € 108.00 / m<sup>2</sup>

Its perspirancy quality or high permeability to water vapor makes it an excellent hygienic regulator. It is also a so-called "phase change" material giving off latent heats of change of state. In other words, this feature ensures optimal summer and winter comfort, without the need for electrical systems. The wall alone manages the phase shifts of temperature and humidity that the structure can experience throughout a year.

These qualities make it a high-performance material which, far above the thresholds, meets the thermal regulations in force.

In addition to its hygrothermal qualities, hemp concrete is a carbon sink for the structure, storing more CO<sub>2</sub> than its life cycle emits.

It also does not emit volatile organic compounds and thus ensures a healthy atmosphere for the user by regulating the surface moisture on the surface of the inner walls. Hemp concrete thus avoids the risk of condensation that can be observed in conventional buildings when mechanical ventilation malfunctions, for example.

The product is under technical notice and holds its professional rules.

The workers made the prefabrication of wood-concrete hemp panels in the workshop. They were able to appreciate the comfort of the workshop work and the speed of implementation on site.

Hemp concrete provides significant thermal and hygroscopic comfort for its occupants.

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Lime (Hemp concrete)

TRADICAL®

Email: [contact@bcb-tradical.com](mailto:contact@bcb-tradical.com)

<http://www.bcb-tradical.com/contact-2/>

Product category : Second œuvre / Cloisons, isolation

Material designed from Gypsum, significantly less energy intensive than cement for its production. Technical information is shown here: <http://www.bcb-tradical.com/wp-content/uploads/2018/02/Brochure-Beton-Chanvre-Tradical-12-2017.pdf>

Cost of hemp concrete per m<sup>2</sup> / ep200mm (excluding wood frame): € 108.00 / m<sup>2</sup>

The material meets the requirements of NF DTU 26.1.

Workers appreciated the prefabrication of wood-concrete hemp panels in the workshop. Because of the comfort and the speed of setting up on site.

Concrete provides a thermal and hygroscopic comfort very appreciated by the occupants.



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BIOFIB TRIO®

CAVAC

Tél : 02 51 36 51 51 Fax : 02 51 36 51 97

<https://www.coop-cavac.fr/>

Product category : Second œuvre / Cloisons, isolation

This material is composed of 92% of vegetable fibers (flax, hemp and cotton) and 8% of binder.

Link: <https://www.biofib.com/files/en/BIOFIB-Trio.pdf>

This material and under technical advice:

[https://www.biofib.com/files/BIOFIB\\_TRIO-Avis\\_technique\\_CSTB\\_Murs.pdf](https://www.biofib.com/files/BIOFIB_TRIO-Avis_technique_CSTB_Murs.pdf)

It does not trigger skin irritation. If inhaled, the body is able to easily destroy this type of plant fibers. In fact, it is appreciated by the workers who implement it.

It also brings a remarkable thermal and acoustic comfort within the building, thus guaranteeing a pleasant working space.

Anecdote: The companions no longer wish to put mineral wool!



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Algo® paint

Algo®

Tél : 02 99 62 77 22

<https://www.peinture-algo.fr/>

Product category : Second œuvre / Peinture, revêtements muraux

Technical link: <http://www.felor.fr/uploads/fichiers/10/algo-pro-prim.pdf>

The paint used is composed of 95% seaweed.

Approximate price: 14.50 € ~ 18.00 € / m<sup>2</sup>

The absence of strong odors of this painting was highly appreciated by both the workers and the users of the offices. On the other hand, its almost non-existent VOC content guarantees a healthy environment on site and in finished premises.

Anecdote: The companions had no more headaches at night and no longer wish to pose other paintings that this one.



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Marmoléum®

Forbo

Tél : 03 26 77 30 30

<https://www.forbo.com/flooring/fr-fr/produits/linoleum-naturel-marmoleum/c928u0>

**Product category :** Second œuvre / Revêtements de sol

This product consists of pine resin, wood flour (non-exotic), linseed oil, pigments and jute.  
Approximate price: 24.92 € / m<sup>2</sup>

The components of this material provide a healthy indoor air. This type of coating is also appreciated for its speed of implementation.



Cork panels

Amorin

Tel : 05.56.34.17.45

<http://www.amorimfrance.fr/liens>

**Product category :** Second œuvre / Cloisons, isolation

Cork is a thermal and acoustic insulator. It is a rotproof biobased material.  
Approximate price: 40.26 € / m<sup>2</sup>

This thermal and sound insulating material has been selected to isolate the slab on the ground floor.  
It is easy and quick to implement.



Rigid wood wool panels (incorporated on prefabricated wood / hemp concrete panels)

STEICO

j.legouas@steico.com

<https://www.steico.com/fr/>

**Product category :** Second œuvre / Cloisons, isolation

Wood wool is a biobased material derived from sawmill waste.  
This insulation has been exploited as ITE and support of coatings (walls).  
Soprema® offers similar panels that benefit from technical advice, for applications on masonry and timber framing.

This material applied as ITE provides additional insulation and eliminates almost all thermal bridges of the building. Its implementation in shop or on site remains simple and fast.



## Costs

### Construction and exploitation costs

Reference global cost : 1 578 950,00 €

Renewable energy systems cost : 23 000,00 €

Reference global cost/Work station : 1578950

Cost of studies : 256 000 €

Total cost of the building : 1 620 000 €

## Carbon

### GHG emissions

GHG in use : 6,10 KgCO<sub>2</sub>/m<sup>2</sup>/an

Methodology used :

Our methodology respects the method developed in the context of the "Carbon Energy" experiment. The life cycle analysis was carried out on the entire project, including outdoor spaces and infrastructure. It integrates emissions

GHG before use : 819,00 KgCO<sub>2</sub> /m<sup>2</sup>

Building lifetime : 50,00 année(s)

, ie xx in use years : 134.26

GHG Cradle to Grave : 1 130,00 KgCO<sub>2</sub> /m<sup>2</sup>

the first calculations show results close to the BBCA and E2C2 levels, they require an update with new FDES, a second study is in progress

## Reasons for participating in the competition(s)

► Energy & temperate climates:

Substantial work has been done to eliminate almost all linear and integrated thermal bridges. The building has been equipped with solar panels on the roof, on a surface of 90m<sup>2</sup>. This helps to meet some of the energy needs for lighting and ATC. The lighting is provided by LED bulbs. Beyond the presence of a manual switch, their brightness varies according to the solar input in the building through a home automation system using photoresistances. The building was the subject of an RT study which revealed Cep, Bbio and Tic values that fully meet the requirements of RT2012 and are considerably closer to the BEPOS requirements. It meets the Effinergie + certification, HPE standard high energy performance, three HQE targets (FIJ, QAI, STD). The building is in the process of being labeled E + C- and BBCA. It targets level 2 of the building label biosourcé.

► Low Carbon:

The building was designed in almost all of bio-based materials. The walls were made of prefabricated wood-concrete hemp panels, and their insulation further improved by the placement of wood fiber panels outside. The roof is entirely made of laminated wood and solid wood for its structure. It is insulated with hemp concrete and Biofib Trio® rolls on areas requiring special attention from an acoustic point of view.

A zinc blanket has been positioned. This material, whose properties allow for significant recycling, significantly limits the environmental impact. In fact, its use fits perfectly into a sustainable development approach.

The partitions are insulated with rolls of Biofib Trio®, made from linen, hemp and cotton, to ensure good acoustic and thermal performance. The interior finish of all hemp concrete walls is provided by hemp lime plaster. All of the Fermacell® partitions (materials made with a significant proportion of recycled gypsum) were given an Algo Pro® paint finish, 95% biobased. The final flooring of the floor is made of Marmoleum®, (Lino® genuine) composed of pine wood resin, linseed oil, wood flour (FSC and PEFC origin wood) and jute. The floor of the ground floor is insulated with two slabs of cork sandwiching the slab carrier.

► Health and comfort:

Perforated wooden acoustic panels are arranged in the stairwell, as well as on certain walls.

Smoke evacuation hatches have been made in accordance to ensure a good evacuation of fumes in case of fire. Solar breezes and solar caps are equipped with a home automation system allowing the inclination of the blades for the regulation of the solar gains in the offices.

Triple glazed windows are arranged throughout the building to ensure optimal thermal and acoustic comfort in offices.

Double glazing with a large area blade for office / corridor separation is installed.

The Algo® paint used for this project has a VOC rate of 1µg / l rate. Performance well beyond the A + ranking.

The design of all the walls made of materials with a very low µ coefficient allows the diffusion of steam and thus ensures a pleasant hygrometry within the building.

Thermal and hygroscopic comfort is mainly ensured by the excellent moisture control capacity of hemp concrete.



The presence of large windows optimizes sunlight. LED bulbs with variable brightness provide lighting that meets lighting standards in offices.

Hemp concrete is a material that emits very little fumes. It limits the risk of poisoning during fires.

Chênevotte and Biofib Trio® produce very little dust and their fibers are not irritating. However, if they were absorbed by the human body and degraded easily, the health risk for the workers working on the site is limited.



The two-stage air handling unit with a flow rate of 36m<sup>3</sup> / h / s

## Building candidate in the category

**Energie & Climats Tempérés**

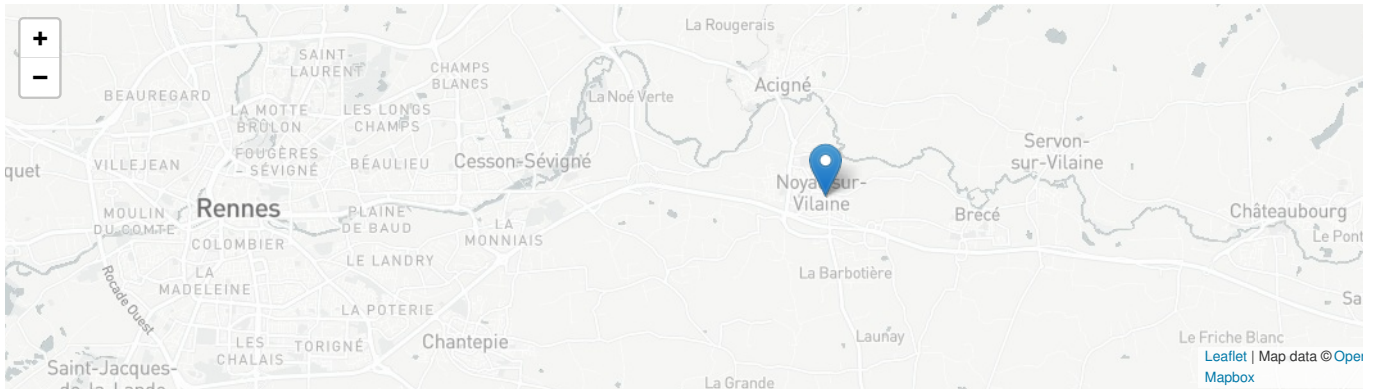






Prix des Etudiants



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