Prefabricated wood-concrete hemp panel building - Triballat

by Margaux PETILLON / 2018-06-11 10:23:07 / France / 17320 / FR

Primary energy need :

49.2 kWhep/m².an

(Calculation method : RT 2012)

ENERGY CONSUMPTION

Economical building

Building

A

< 50	A
51 à 90	B
91 à 150	C
151 à 230	D
231 à 330	E
331 à 450	F
> 450	G

Energy-intensive building

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 m²
Construction/refurbishment cost : 1 620 000 €
Cost/m2 : 1732.62 €/m²

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

Function : Company

Ets ANGEVIN

gregory.aubry@angevin.fr

http://www.groupe-angevin.fr/
Lot VRD & GO

Function : Company

EURL LB ECO HABITAT / ACEIS

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

http://www.aceis.fr/
Lot of hemp concrete & int / ext finishes

Function : Company

CMB

valentin.hachet@cmd-bois.fr

https://cmb-bois.fr/
Lot timber frame

Function : Company

Ets Heriau

k.delmotte@heriaucouverture.fr

http://heriaucouverture.fr/
Lot Cover

Function : Company

SAS BARON

contact@baron-menuiserie.fr

http://www.baron-sas.fr/
Lot Aluminum exterior carpentry & Locksmithing

Function : Company

CMagencement

castelmenuiserie@wanadoo.fr

http://www.cm-agencement.com/fr/accueil
Lot Woodwork interior / exterior wood

Function : Company

LANGLOIS SOBRETI

langlois@langloissobreti.fr

http://www.langloissobreti.fr/

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

Contracting method

Separate batches

Type of market

Global performance contract

Energy

Energy consumption

Primary energy need : 49,20 kWhep/m^2.an

Primary energy need for standard building : 96,40 kWhep/m^2.an

Calculation method : RT 2012

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 kWhef/m^2.an

Envelope performance

Envelope U-Value : 0,72 $W.m^{-2}.K^{-1}$

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 : n50

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.

Renewables & systems

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 m² 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^2

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

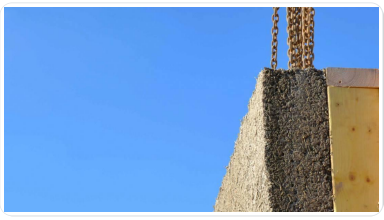
Chènevotte (Hemp concrete)

Agro Chanvre

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

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

Product category : Finishing work / Partitions, insulation



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 m² / ep200mm (excluding wood frame): € 108.00 / m²
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 CO2 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.

Lime (Hemp concrete)

TRADICAL®

Email: contact@bcb-tradical.com

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

Product category : Finishing work / Partitions, insulation

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 m² / ep200mm (excluding wood frame): € 108.00 / m²

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.

BIOFIB TRIO®

CAVAC

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

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

Product category : Finishing work / Partitions, insulation

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
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!

Algo® paint

Algo®

Tél : 02 99 62 77 22

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

Product category : Finishing work / paints, mural, wallcoverings

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 € / m²

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.

Marmoléum®

Forbo

Tél : 03 26 77 30 30

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

Product category : Finishing work / flooring

This product consists of pine resin, wood flour (non-exotic), linseed oil, pigments and jute.
Approximate price: 24.92 € / m²

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 : Finishing work / Partitions, insulation

Cork is a thermal and acoustic insulator. It is a rotproof biobased material.
Approximate price: 40.26 € / m²

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 : Finishing work / Partitions, insulation

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 $KgCO_2/m^2/an$

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 $KgCO_2$ $/m^2$

Building lifetime : 50,00 année(s)

, ie xx in use years : 134.26

GHG Cradle to Grave : 1 130,00 $KgCO_2$ $/m^2$

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

Contest

Reasons for participating in the competition(s)

► **Énergie & Climats tempérés:**

- Un travail conséquent a été effectué pour éliminer la quasi-totalité des ponts thermiques linéaires et intégrés.
- Le bâtiment a été équipé de panneaux solaires en toiture, sur une surface de 90m². Cela permet de répondre en partie aux besoins en énergie pour l'éclairage et la CTA.
- L'éclairage est assuré par des ampoules LED. Au-delà de la présence d'un interrupteur manuel, leur luminosité varie en fonction de l'apport solaire dans le bâtiment grâce à un système domotique utilisant des photorésistances.
- Le bâtiment a fait l'objet d'une étude RT qui a révélé des valeurs Cep, Bbio et Tic répondant pleinement aux exigences de la RT2012 et se rapprochant considérablement des exigences BEPOS. Il répond à la certification Effinergie+, haute performances énergétique standard HPE, trois cibles HQE (FIJ, QAI, STD). Le bâtiment est en cours de labellisation E+C- et BBCA. Il vise le niveau 2 du label bâtiment biosourcé.

► **Bas Carbone:**

- Le bâtiment a été conçu dans sa quasi-totalité en matériaux biosourcés. Les murs ont été réalisés en panneaux préfabriqués bois-béton de chanvre, et leur isolation encore perfectionnée par la mise en place de panneaux de fibre de bois à l'extérieur.
- La toiture est entièrement réalisée en bois lamellé-collé et bois massif pour sa structure. Elle est isolée en béton de chanvre et rouleaux de Biofib Trio® sur les zones nécessitant une attention particulière d'un point de vue acoustique.
- Une couverture zinc a été positionnée. Ce matériau dont les propriétés permettent un recyclage important, limite de manière conséquente l'impact environnemental. De fait, son utilisation s'inscrit parfaitement dans une démarche de développement durable.
- Les cloisons sont isolées avec des rouleaux de Biofib Trio®, élaborés à partir de lin, chanvre et coton, afin d'assurer de bonnes performances acoustiques et thermiques.
- La finition intérieure de l'ensemble des murs en béton de chanvre est assurée par un enduit chaux chanvre.
- L'ensemble des cloisons en Fermacell® (matériaux réalisé avec une part non négligeable de gypse recyclé) a quant à elle, reçu une finition de peinture Algo Pro ®, composée à 95% de matières biosourcés.
- Le revêtement de sol final de l'étage est réalisé en Marmoléum®, (Lino® véritable) composé de résine de bois de pin, d'huile de lin , farine de bois (bois d'origine FSC et PEFC) et de jute.
- Le plancher du RDC est isolé avec deux dalles de liège prenant en « sandwich » la dalle porteuse.

► **Santé et confort:**

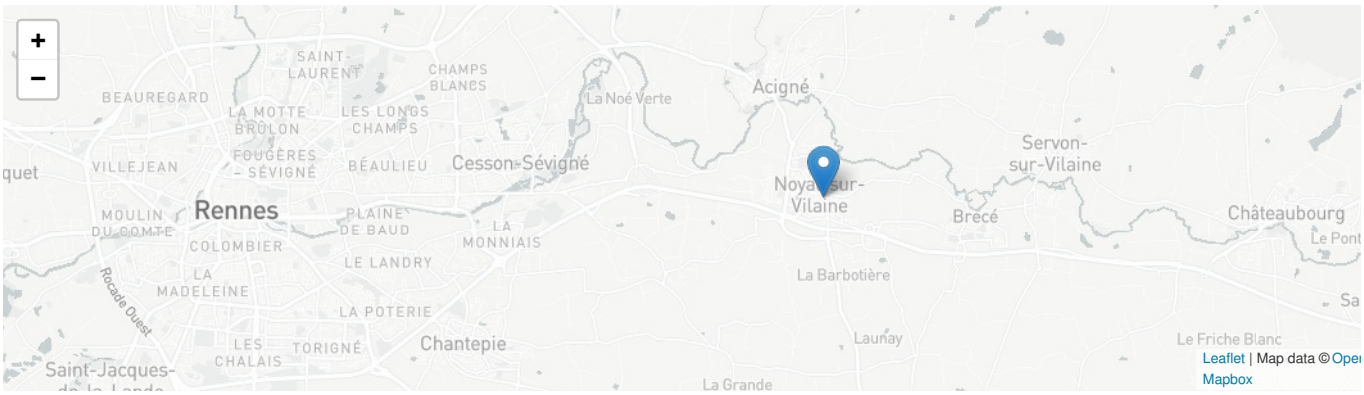
- Des panneaux acoustiques en bois perforés sont disposés dans la cage d'escalier, ainsi que sur certaines parois.
- Les trappes de désenfumage ont été réalisées de manière conforme afin de garantir une bonne évacuation des fumées en cas d'incendie.
- Les brises-soleil et casquettes solaires sont équipés d'un système domotique permettant l'inclinaison des pales pour la régulation des apports solaires dans les bureaux.
- Des fenêtres triples vitrages sont disposées sur l'ensemble du bâtiment pour assurer un confort thermique et acoustique optimal dans les bureaux.
- Un double-vitrages avec une importante lame d'aire pour la séparation bureau/couloir est installé.
- La peinture Algo® utilisée pour ce projet bénéficie d'un taux de COV de 1µg/l taux. Performance se situant bien au-delà du classement A+.
- La conception de l'ensemble des parois réalisées avec des matériaux ayant un coefficient µ très faible permet la diffusion de vapeur et garantit ainsi une hygrométrie agréable au sein du bâtiment.
- Le confort thermique et hygroscopique est principalement assuré par l'excellente capacité de régulation de l'humidité du béton de chanvre.
- La présence de grandes baies vitrées optimise les apports lumineux solaires. Des ampoules LEDs à luminosité variables assurent un éclairage respectant les normes d'éclairage dans les bureaux.
- Le béton de chanvre est un matériau qui émet très peu de fumées.Il limite ainsi les risques d'intoxication lors d'incendies
- La chènevotte et le Biofib Trio® produisent très peu de poussières et leurs fibres ne sont pas irritantes. Si elles étaient cependant absorbées par le corps humain, se dégradant facilement, le risque sanitaire pour les ouvriers œuvrant sur le chantier est limité.
- La CTA à deux étages de filtration et elle assure un débit pour le renouvellement d'air à 36m3/h/prs

Building candidate in the category

Energie & Climats Tempérés

Coup de Cœur des Internautes

Prix des Etudiants



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