


Green Wheat

by gauthier claramunt / 2019-06-17 15:50:35 / France / 6543 / FR

New Construction



Primary energy need :

3.9 kWh_{ep}/m².an

(Calculation method : RT 2012)

ENERGY CONSUMPTION

Economical building *Building*

< 50	A	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 : Student residence
Construction Year : 2018
Delivery year : 2018
Address 1 - street : Lycée Xavier Bernard 86480 ROUILLÉ, France
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 695 m² SHON
Construction/refurbishment cost : 1 120 000 €
Cost/m2 : 1611.51 €/m²

Certifications :



General information

The wheat field offers a calm view, with constant light, conducive to concentration and rest. The project makes the most of this orientation by concentrating most student rooms. The proportion of the generic room has been designed to meet the desire for modularity of its layout. The window is conceived as a use, an additional space, in direct relation with the immense landscape proposed by the place. Around the main entrance are the daylight areas and the supervisor's room. The central circulation becomes a place of exchange and benefits from the natural lighting of the wind towers. There are lockers and forms of niches to sit and discuss in the chimneys and cool summer.

By its bioclimatic components, the project is exemplary in terms of sustainable development for the following reasons:

- It exploits the complex physical properties of lime-treated straw and mud brick in the margins of market standards,
- It uses, among other things, a climatic well, combined with a simple reverse flow ventilation (low tech) and recovers water to limit the use of drinking water in toilets.
- it exploits and controls the zenith light and air currents to manage the summer comfort
- it has been analyzed as part of the OBEC experiment and has been classified E4C2, yet deemed inaccessible (very high environmental performance), without

having specifically sought it.

- it was conceived and carried out as soon as the sketch by a team of welded and prospective project management, committed to a permanent environmental approach.

- Although it is a boarding school, we tried to spark the interest of high school students by offering workshops to discover construction techniques, in parallel with their educational program.

Sustainable development approach of the project owner

The Region has published its roadmap for sustainable development. The project "Green Wheat" served as a laboratory for the Region for the use of biosourced materials associated with the quest for energy performance and the reduction of greenhouse gas emissions. The result E4C2 is the proof that the squaring between E and C is not fantasy.

Architectural description

Agricultural high school embraces the scope of the trades of the land. Its architecture can also demonstrate the multiple ramifications of soil products.

The project uses plant materials, including local (straw and ground) and regional (hemp and wood) sectors.

During the study we oriented the constructive choices according to the development of the local sector. We also provided students with the results of this research.

Rainwater harvesting and composting are two other demonstrative assets of the relationship between architecture and agriculture.

The water recovered and stored in the three tanks is used not only for watering but also for maintenance and toilets.

The garden in the valley can then become a field of experimentation on a small scale to verify the combination of all these sources necessary for the growth.

The figure of the project is inspired by this organic cycle from the shape of the roof as a landscape draining water and light, to the material of the wall, clay plaster potentially from the same excavations of the site.

Thus all the axes of the project that our team has shaped over the course of many design exchanges have been conceived not only in the sense of the performance and the intrinsic quality of the building, but also in its ability to give a harmonious account of its behavior.

Nothing was left to chance: hygrothermal, acoustic and visual comforts, energy optimization, common space amenities, occupant health, durable structures and ease of maintenance.

Building users opinion

The energy bill of the school has not increased since the commissioning of the school.

Students are good in winter as in summer

If you had to do it again?

We would reproduce it exactly the same way.

See more details about this project

<http://www.dauphins-architecture.com/les-bles-en-herbe/>

Photo credit

Dauphins architecture

Stakeholders

Contractor

Name : Région Nouvelle Aquitaine, Antenne de Poitiers

Contact : Cécile Varache cecile.varache[at]nouvelle-aquitaine.fr

Construction Manager

Name : dauphins architecture

Contact : gauthier claramunt 0682358828

<http://www.dauphins-architecture.com/>

Stakeholders

Function : Thermal consultancy agency

Overdrive

Arnaud Hillon a.hillon[at]overdrive.fr

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

Function : Other consultancy agency

180 degrees ingénierie

Julien Coeurdevey 0607472230

<http://www.180ingenierie.com/>

environmental engineer

Function : Other consultancy agency

AMOES

Julien Staal julien.staal[at]amoes.com

<https://www.amoes.com/>

OBEC engineer

Type of market

Global performance contract

Energy

Energy consumption

Primary energy need : 3,90 kWh_{ep}/m².an

Primary energy need for standard building : 117,00 kWh_{ep}/m².an

Calculation method : RT 2012

CEEB : 0.0001

Envelope performance

Renewables & systems

Systems

Heating system :

- Wood boiler
- Canadian well

Hot water system :

- Other hot water system
- Wood boiler

Cooling system :

- Canadian well

Ventilation system :

- Nocturnal Over ventilation
- Free-cooling
- Canadian well

Renewable systems :

- Solar photovoltaic
- Wood boiler
- Micro wind

Environment

Urban environment

Land plot area : 1 890,00 m²

Built-up area : 860,00 %

The wheat field offers a calm view, with constant light, conducive to concentration and rest. The project makes the most of this orientation by concentrating most student rooms. By taking advantage of the first rays of the day, students will see their use of artificial light decrease and will see the benefits of natural light.

Products

Product

Bale of straw

Product category : Second œuvre / Cloisons, isolation

The straw boot has been appropriately accepted by the contracting authority, in particular because it is integrated in current construction technique, professional rules in support.

climate well

Elixir

Product category : Gros œuvre / Système passif

The name "climatic well" refers to passive duplication in pre-treatment of fresh air (summer + winter)

The Region knows the process. The user has observed that pretreatment makes the incoming air more comfortable.

EP recovery tank

Ecociter

Product category : Aménagement extérieurs / Gestion des eaux pluviales

two units:

one dedicated to irrigation water

the other in relay of the consumption of the toilets (WC only): objective 50% of EP

The Region knows the system.

O'Box

EHTECH

Product category : Génie climatique, électricité / Chauffage, eau chaude

Gray water heat recovery system

The Region has tested this system. Looking back on experience

User idem

Costs

Construction and exploitation costs

Total cost of the building : 1 120 000 €

Carbon

GHG emissions

GHG in use : 11,00 KgCO₂/m²/an

Methodology used :

Experimentation E + C- / OBEC Program

Building lifetime : 50,00 année(s)

Life Cycle Analysis

Eco-design material :

The Wood Framing Wall is the lightest, least impacting structural mode (40% less than CLT, 90% less than concrete).

Straw is the only material with a negative carbon impact and the biobased material has the highest carbon footprint.

Contest

Reasons for participating in the competition(s)

- Bio-based and recycled materials

Our choices were on the wooden frame, the insulating infill in straw bales, the thermal inertia contribution in mud bricks, the insulation of the cellulose wadding roof.

- Renewable energies

The building is powered by the wood boiler on the site of the agricultural college. The photovoltaic system, small capacity because the great intrinsic performance of the building requires very little compensation, and the small wind turbine inserted in the roof, produce electricity.

- Zero energy building

True to its DNA, the design team has addressed the issue of positive energy through a drastic process of reducing the need for energy before requiring the implementation of complex, expensive and polluting technological solutions.

This approach is completed in the second place by natural ventilation devices, geothermal (climatic well used in the summer to passively cool the building, winter to preheat the fresh air), heat recovery on greywater (in the showers). Electricity is produced by a wind turbine and photovoltaic panels. Rainwater is collected in two large underground tanks to feed flushing toilets in the toilets and water the green spaces.

- Health and comfort

The hygrothermal comfort conditions have been greatly improved compared to conventional constructions, by exploiting the properties of natural materials. The straw offers an excellent phase shift and thermal damping: indeed only about 5% of the solar heat wave passes through the straw bale, and arrives inside with a phase shift of 10 hours. In addition, the straw and the raw earth regulate the humidity in the interior air thanks to their properties (nature of the fibers and microstructure of the ground). Finally, neither of them diffuse pollutants into the indoor air.

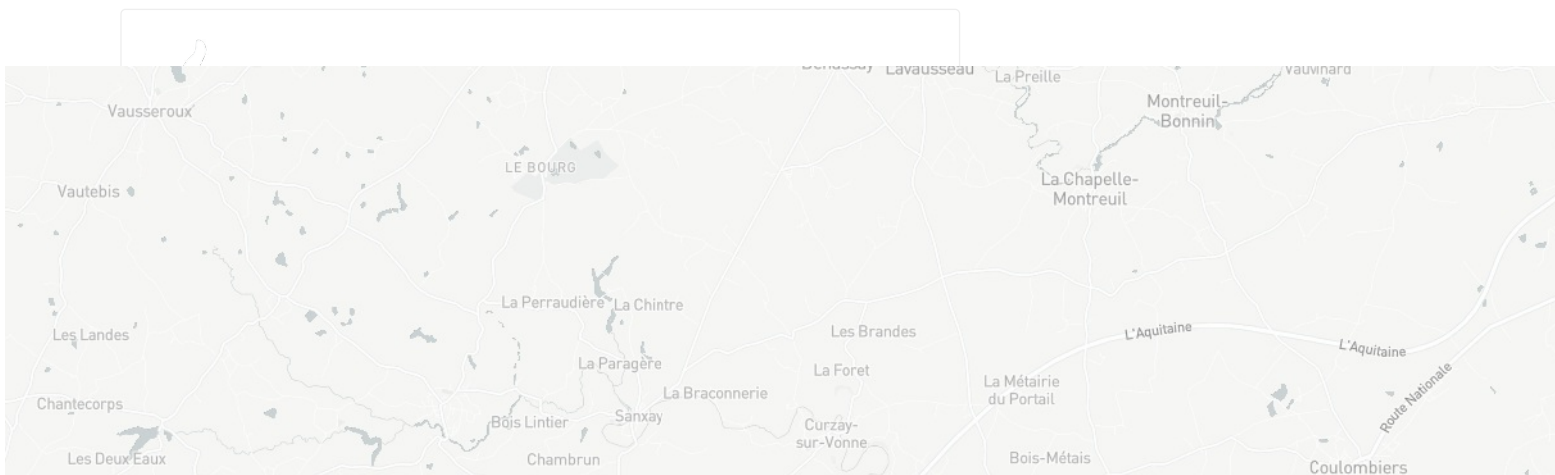
- Low carbon

Bioclimatic architecture and natural matter (wood, straw, lime, raw earth) are at the heart of our approach to positive energy. The massive use of wood and straw, both storing carbon, strongly favors the reduction of the project footprint. The contribution of inertia by uncooked mineral matter (raw earth) logically complements our overall approach.

Building candidate in the category



Bas Carbone





Prix des Etudiants



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