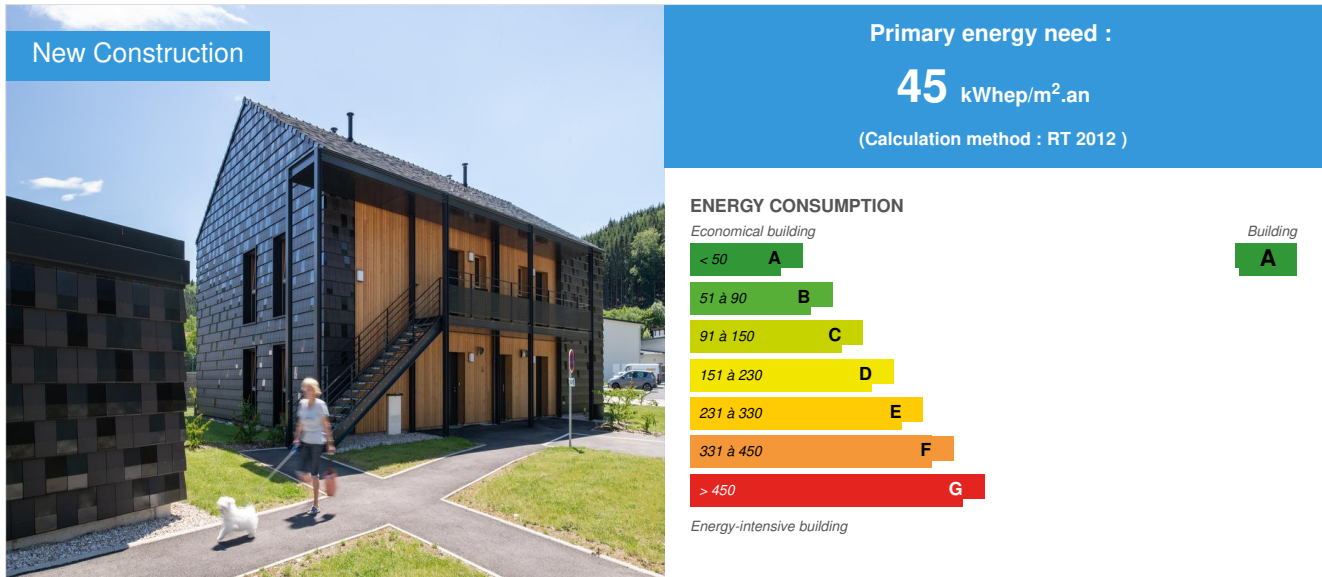


4 passive social housing in straw wood

by Antoine Pagnoux / 2020-11-06 10:45:06 / France / 12810 / FR



Building Type : Collective housing < 50m
Construction Year : 2018
Delivery year : 2018
Address 1 - street : 4 rue de la Meurthe 88230 PLAINFAING, France
Climate zone : [Cbc] Mild, dry winter, warm and wet summer.

Net Floor Area : 317 m²
Construction/refurbishment cost : 487 000 €
Cost/m² : 1536.28 €/m²

Certifications :



General information

This building was awarded the Low Carbon Prize of the Green Solutions Awards 2020-21, at both the national and international levels.

This project of 4 collective social housing is located on the edge of the center of the Vosges commune of Plainfaing on a small plot of approximately 1000m².

Composed of a compact main building (in R + 1 without basement) oriented to the South and a small annex building regrouping carport and individual 2-wheeler rooms. The position of the latter makes it possible to limit the impact of vehicles.

A simple and pragmatic design methodology

1. Sobriety: Reduction to a minimum of all needs (bioclimatism, compactness, optimization of the plan and technical rooms)
2. Efficiency: Perfectly continuous and hyper-insulated structure and envelope, absolute airtightness , certified high efficiency double flow ventilation, heat

recovery from gray water

3. Renewable: use of renewable energies and for the construction of structural materials at 90% by volume plant fiber

Low carbon as a leitmotif

These social housing units are entirely built in wood structure. They are and insulated in straw (walls) and cellulose (ceiling). 90% of the materials by volume are derived from plant fibers. This choice also makes it possible to provide an excellent phase shift for summer comfort.

The simplicity of the plan allows centralization and pooling of energy systems.

Collective heating and DHW production are provided by an extract air heat pump. In addition, each accommodation is equipped with an individual log stove (the outdoor 2-wheel room is largely sized and ventilated to be able to also store its wood)

The accommodation is ventilated by a collective double-flow CMV which serves as a heating vector (no other heat emitter)

A heat recovery system from gray water in showers also reduces energy requirements.

Thus, these 4 biosourced dwellings, using renewable energies, integrated in their environment but also in their time, offer extremely low energy charges to tenants: 15 € / month / housing for 100% heating + DHW + ventilation + maintenance!

A vernacular and bioclimatic architectural gesture

The building presents a sober architecture underlined by a fine treatment of the constructive details. It is south facing and has bioclimatic outskirts. The treatment of the surrounding biodiversity makes it possible to integrate it perfectly into the landscape.

The main monolithic volume, which is reminiscent of that of the Vosges farm buildings, is covered with a "skin" made of terracotta. This "living" cladding resulting from the progressive mixture of three models of tiles (matt black and black and glazed gray) evokes the traditional wood essis and plays with its reflections to blend into its pastoral setting.

The wooden cladding used only in protected parts of the facades reveals the essence of the construction and is intended as an invitation to come and discover the soul of homes.

This building was awarded the 2019 Envirobot Grand Est Prize, category new collective housing.

Sustainable development approach of the project owner

This project is based on the negawatt philosophy and methodology:

1 / Sobriety: Reduction to a minimum of all needs (bioclimatism, compactness, optimization of the plan and technical rooms)

2 / Efficiency: Perfectly continuous and hyper-insulated structure and envelope, absolute airtightness, certified high efficiency double flow ventilation, heat recovery from gray water

3 / Renewable: use of renewable energies and, for construction, structural materials containing 90% by volume of plant fiber

Architectural description

Composed of a compact main building (in R + 1) without basement) oriented towards the South and of a small annex building regrouping car-port and individual 2-wheelers premises. The position of the latter makes it possible to limit the impact of vehicles.

It presents a sober architecture, underlined by a fine treatment of the constructive details. The main monolithic volume, which is reminiscent of that of the Vosges farm buildings, is covered with a "skin" made of terracotta. This facetiously faceted cladding resulting from the degraded mix of three models of tiles (black and glazed gray and matt and matt black) evokes traditional wood essis and plays with its reflections to blend into its pastoral setting.

The wooden cladding used only in protected parts of the facades, reveals the essence of the construction and is intended as an invitation to come and discover the soul of homes.

The building is entirely constructed in a wooden structure and insulated with straw for the walls and cellulose for the ceiling.

Photo credit

Thomas Devard and ASP Architecture

Stakeholders

Contractor

Name : SA HLM Le Toit Vosgien

<https://www.toit-vosgien.com/>

Construction Manager

Name : ASP Architecture

Stakeholders

Function : Thermal consultancy agency

Terranergie

<https://www.construction21.org/france/company/fr/terrangerie-bureau-detudes.html>

Energy

Energy consumption

Primary energy need : 45,00 kWhep/m².an

Primary energy need for standard building : 70,00 kWhep/m².an

Calculation method : RT 2012

CEEB : 0.0001

Breakdown for energy consumption : Heating 14kWh / m² of log wood DHW 12kWh / m² of renewable electricity (collective CET R290) CMV Double Flux 3kWh / m² Household electrical appliances: 60kWh / m²

Real final energy consumption

Final Energy : 117,00 kWh_{ef}/m².an

Envelope performance

Indicator : n50

Air Tightness Value : 0,60

Renewables & systems

Systems

Heating system :

- Others
- Wood boiler

Hot water system :

- Heat pump

Cooling system :

- No cooling system

Ventilation system :

- Double flow heat exchanger

Renewable systems :

- Wood boiler
- Heat pump

Other information on HVAC :

The simplicity of the plan allows centralization and pooling of energy systems.

Collective heating and DHW production are provided by an extract air heat pump. In addition, each accommodation is equipped with an individual log stove (the outdoor 2-wheel room is largely sized and ventilated to be able to also store its wood).

The accommodations are ventilated by a collective double-flow CMV which serves as a heating vector (no other heat emitter).

A heat recovery system from gray water from showers also reduces energy needs (provides 25% of the DHW).

Environment

Urban environment

Land plot area : 1 056,00 m²

The site is located near the city center, 200m from the Town Hall and therefore public transport.

Study of solar masks so as not to create shadows on neighboring plots.

Adaptation to a land with little influence while giving the project a bioclimatic orientation towards the south.

Minimization of non-vegetated surfaces.

All the outdoor facilities (parking, pedestrian roads, private terraces, etc.) and the 2 ground floor accommodation are accessible for people with reduced mobility.

Products

Product

Straw

Passiv Home

Product category : Structural work / Carpentry, cover, tightness

...



Costs

Energy bill

Forecasted energy bill/year : 150,00 €

Real energy cost/m² : 0.47

Real energy cost/Dwelling : 37.5

Health and comfort

Indoor Air quality

VMC Double flow at 0.5Vol / h 24h / 24

Any VOC class A + finishing product

Comfort

Health & comfort :

VMC Double flow at 0.5Vol / h 24h / 24

Any VOC class A + finishing product

Calculated indoor CO₂ concentration :

<600ppm

Calculated thermal comfort : Taux de surchauffe >25° < 5%

Measured thermal comfort : idem études

Acoustic comfort : According

Daylight factor : >2,5% sur 80% des pièces ayant accès

Carbon

GHG emissions

GHG in use : 3,00 KgCO₂/m²/an

Methodology used :

All use via Phpp and ADEME emission factor

GHG before use : 700,00 KgCO₂/m²

Building lifetime : 50,00 année(s)

, ie xx in use years : 233.33

GHG Cradle to Grave : 850,00 KgCO₂/m²

E-Licco / ADEME

Life Cycle Analysis

Eco-design material :

The wood and straw used are renewable, local and minimally processed materials.

The use of healthy materials also makes it possible one day to envisage a simple and sober deconstruction.

More information on embodied energy in the PDF doc inserted in description.

Contest

Reasons for participating in the competition(s)

Matériaux durables et locaux :

La structure du bâtiment est composée à 90% de fibres végétales (bois et paille) locaux et peu transformés. Ces matériaux permettent d'envisager une déconstruction simple et sobre, et sont recyclables. Pour le passif, la conception bioclimatique met l'accent sur l'enveloppe qui est prioritaire et ne changera pas avant 60 ans contrairement aux systèmes énergétiques.

Performance énergétique :

La structure et l'enveloppe permettent isolation et étanchéité. L'installation d'une ventilation double flux sert de vecteur au chauffage à base d'un poêle individuel à bûches. Chaque logement possède en plus un local 2 roues aéré prévu pour stocker le bois. Le plan du bâtiment permet la centralisation des systèmes énergétiques, et la chaleur est aussi récupérée sur les eaux grises des douches.

Enjeu social :

Le but était aussi de proposer des charges énergétiques extrêmement faibles aux locataires qui sont des familles à faibles revenus : 15€/mois/logement. Cette réduction des charges permet l'intégration sociale des familles et l'augmentation de leur pouvoir d'achat. Le bâtiment, qui s'inscrit dans l'architecture vosgienne de sa région, est à 200m de la mairie et des transports en commun.

Building candidate in the category



Bas Carbone

