Rehabilitation of an old barn into a detached house

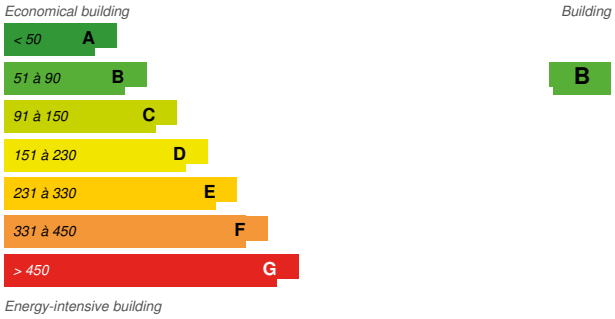
by REMBOWSKI CAROLINE / 2021-03-17 18:17:39 / France / 7900 / FR

Primary energy need :

52 kWhep/m².an

(Calculation method : RT 2012)

ENERGY CONSUMPTION



Building Type : Isolated or semi-detached house
Construction Year : 1940
Delivery year : 2017
Address 1 - street : 4303 route de viallière 38780 SEPTEME, France
Climate zone : [Dwa] Humid Continental Hot Summer, severe, dry winter

Net Floor Area : 196 m² Autre type de surface nette
Construction/refurbishment cost : 230 000 €
Cost/m2 : 1173.47 €/m²

General information

It is an old adobe barn dating from 1940 that has been transformed and rehabilitated into a contemporary living house.

The choice of biosourced materials...

This house benefits from a biosourced facade coating made of lime and hemp. Acting as an insulator, this coating contributes to the building's inertia, which limits the impact of outside temperature variations on the building's interior temperature, **and thus improves the occupants' comfort.**

Thanks to this solution, the house **benefits from an excellent summer comfort**. The high thermal effusivity of the product used is 156 J/K.m2.s1/2. This provides a good thermal phase shift: **4H20 of additional inertia to that of the adobe wall, for a thickness of 8 cm of coating.**

The house **also benefits from a winter comfort. The thermal conductivity of the product is λ = 0.066 W/m.K (at 23 ° C and 50% of H.R)**

Key to the renovation of this type of building the transfer of water vapor is optimized: water vapor permeability of the product **μ = 4.2, very low for a better breathability and a limitation of condensation in the walls.**
This creates the conditions for a healthier environment limiting the development of mold and dust mites.

Finally, thanks to this solution, **the house benefits from a significant acoustic comfort**. The solution shows acoustic performance by transmission loss: 53 dB for 5 cm thickness.

In addition, **the interior walls** of the house were coated with a lime-based solution that provides the building with a healthier, VOC-free interior environment.

Testimonials

"*We wanted to create a healthy, warm and modern house, respecting the old building.*

We wanted to use natural materials and to have a balance between the old and the new, both through the architecture of the building and the materials used.

We therefore kept the adobe walls and did a lot of masonry work to enlarge the existing openings and create new ones to bring light into the house. We also enhanced an old window discovered during the work, which is now an interior niche whose molasse contours recall the charm of the old.

In order to capitalize on the breathing properties and the inertia of the adobe while ensuring a good insulation of the house, we have favored a lime / hemp coating on the outside, PARNATUR Corps d'Enduit Chanvre from PAREXLANKO.

For the interior, again, we wanted to use a natural coating and we chose a lime coating (PARLUMIERE CLAIR by PAREXLANKO).

Inside and outside we have given an important place to wood in order to bring warmth (parquet, doors, wooden terrace...), and we have also integrated steel to bring a modernity to the whole (structure of the staircase, visible IPN above the windows, footbridge with IPN...).

The whole constitutes a harmonious alliance old/modern, respectful of the charm of the old building highlighted through the choice of noble and natural materials."

Sustainable development approach of the project owner

OBJECTIVE: to preserve the properties of rammed earth (inertia and perspiration) but also the spirit of this old building, thanks to the choice of natural and warm materials. Combine the authenticity of the old with the modern by using the most natural products possible.

Architectural description

Rather classic rural pavilion with modern facades with large glazed openings to bring in light.

Building users opinion

It is a house in which you feel good, bathed in natural light with large living spaces. Thermal comfort regulated in summer as in winter by the inertia of the adobe walls coated with PARNATUR Corps d'Enduit Chanvre.

Photo credit

Vincent Drevon

Stakeholders

Contractor

Name : Entreprise DREVON MACONNERIE

Construction Manager

Name : Entreprises DREVON MACONNERIE
Contact : O6 32 28 85 02

Stakeholders

Function : Environmental consultancy

Entreprise LCF LAZ CREATEUR DE FACADE ELMAS CELAL

Function : Environmental consultancy

Entreprise PIERROT PLOMBIER

Function : Environmental consultancy

Entreprise PATRICK POIPY ELECTRICITE

Energy

Energy consumption

Primary energy need : 52,00 kWhep/m^2.an

Primary energy need for standard building : 100,00 kWhep/m^2.an

Calculation method : RT 2012

CEEB : 0.0002

Initial consumption : 150,00 kWhep/m^2.an

Real final energy consumption

Final Energy : 10 330,00 kWhef/m^2.an

Envelope performance

More information :
40 cm thick adobe walls and exterior application of PARNATUR Corps d'Enduit Hemp 8 cm thick covered with a decorative lime plaster of 1.2 cm. A decorative lime-based plaster was applied to the interior over 1 cm.

More information

2018: 12,792 kwh 2019: 15,064 kwh Exterior plastering work carried out in June 2019-2020: 10,330 kwh

Renewables & systems

Systems

Heating system :
- Heat pump
- Wood boiler

Hot water system :
- Heat pump

Cooling system :
- No cooling system

Ventilation system :
- humidity sensitive Air Handling Unit (hygro A

Renewable systems :
- No renewable energy systems

Environment

Urban environment

Land plot area : 1 097,00 m^2

Built-up area : 25,00 %

Green space : 500,00

The house is located in Septème, a town of less than 3,000 inhabitants located in the Isère department, in the Auvergne-Rhône-Alpes region.

Products

Product

PARNATUR HEMP COATING BODY

PAREXLANKO

CYRIL LEMOING cyril.lemoing[a]parex-group.com

https://www.parexlanko.com/fr

Product category : Gros œuvre / Structure, maçonnerie, façade

With its simplified implementation using a coating spraying machine, this innovation provides additional thermal and acoustic insulation and can, if necessary, compensate for planimetric defects, thanks to a thickness of implementation. possible from 2 to 8 cm. A concrete and effective response for all construction professionals to the new challenges of energy transition, PARNATUR CORPS D'ENDUIT HANVRE is an innovative two-component solution, consisting of a lime-based binder and a bio-based aggregate, the hemp hemp. PARNATUR CORPS D'ENDUIT HANVRE can be applied both indoors and outdoors by mechanical spraying. It is compatible with a wide variety of old building supports (rammed earth, rubble stone, brick, mud, natural stone, hemp concrete, etc.) and can be combined with a wide choice of definitions from the PAREXLANKO HERITAGE range. PAREXLANKO HEMP COATING is the 1st projectable biobased solution on the market with excellent thermal (λ = 0.066 W / mK), hygrothermal (Moisture Balanced Value - MBV 2.9) and acoustic (transmission loss 53 dB for 5) performance. cm thick).

PARNATUR CORPS D'ENDUIT HEMP is appreciated by craftsmen already using hemp because this solution is much easier to apply, mechanical application, easier physically, with a high productivity 80 M2 / day against 30/40 M2 by manual and all without loss of product.

Costs

Construction and exploitation costs

Total cost of the building : 230 000 €

Health and comfort

Comfort

Health & comfort :

Contribution to summer comfort thanks to the increase in thermal inertia of around 4H20 and contribution to winter comfort thanks to thermal improvement (Lamba = 0.066 W / mK).

Calculated thermal comfort : (Lamba = 0,066 W/m.K) R = 1,20 M2.K /w pour 8 cm de PARNATUR Diffusivité = 0,179mm2/s Effisivité = 156 J/K.m2.s1/2
Measured thermal comfort : Confort d'hiver gain de 1,5°C Confort d'été amélioré de 3 °C

Acoustic comfort :

Transmission loss for 5 cm thickness of 53 dB.

Carbon

Life Cycle Analysis

Eco-design material :

Use of the PARNATUR bio-based product 25% hemp plaster body, the carbon footprint of which from FDES is 6.32 kgCO2eq / m2 of plaster applied. On this project, the carbon payback time is 3 years and the carbon saved over 50 years is around 44 tonnes CO2 for gas or 35 tonnes for electricity.

Contest

Reasons for participating in the competition(s)

Performances to improve the daily well-being of the house throughout the year:

- **Summer comfort** ensured by the thermal inertia of the solution used to limit the entry of heat into the house
- **Winter comfort** thanks to the thermal insulation performance of the solution used while reducing the energy bill
- **Comfort of life** guarantees thanks to the product's permeability to water vapor, which limits condensation in the walls and the development of molds and microorganisms
- Finally, **acoustic comfort** is also optimized thanks to the solution which improves the acoustic insulation of the walls.

In addition, the lime and hemp-based biobased facade plaster shows that the client wanted to use bio-based materials, in particular making the quality of the

indoor air healthier.

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