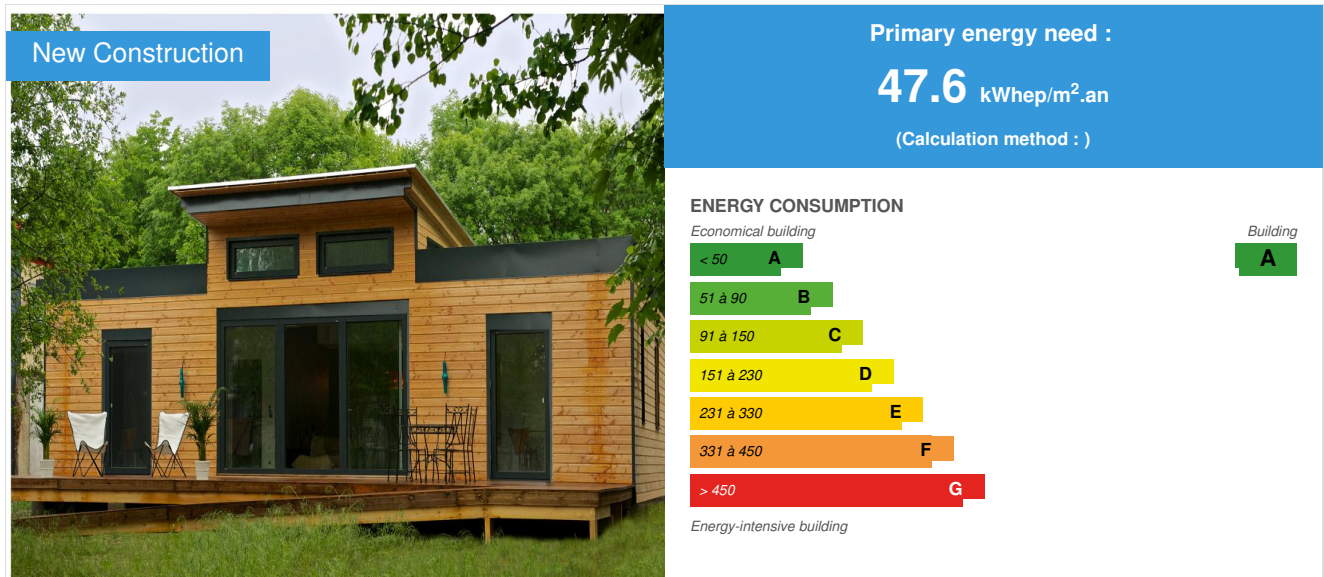


## Vermont House (ECOXIA Intelligent Envelope )

by [Olivier Riscala](#) / 2015-06-24 16:32:08 / France / 20164 / FR



**Building Type** : Terraced Individual housing  
**Construction Year** : 2013  
**Delivery year** : 2014  
**Address 1 - street** : 43, rue Royale 91330 YERRES, France  
**Climate zone** : [Cfb] Marine Mild Winter, warm summer, no dry season.

**Net Floor Area** : 110 m<sup>2</sup>  
**Construction/refurbishment cost** : 200 000 €  
**Number of Dwelling** : 1 Dwelling  
**Cost/m<sup>2</sup>** : 1818.18 €/m<sup>2</sup>

### General information

House model to demonstrate the interest of the ECOXIA intelligent envelope for manufacturers:

- Energy Performance (positive energy with only 20m<sup>2</sup> of solar panels)
- quality of indoor air
- eco-construction (wood)
- and many other welfare features.

A fast, reliable, plug & play and customizable solution. The Vermont House has an excellent energy consumption results , measured over time.

Vermont house, situated in Yerres (91) is the first ECOXIA's project integrating the Smart Constructive Envelope solution.

This experience served to commercialize the solution through measuring the real performance of a passive type building, integrating renewable energies.

The objective of the Smart Constructive Envelope solution is to democratize the passive building and the Positive Energy Building in France and Europe. The Smart Constructive Envelope was improved thanks to this experience and is available for construction professionals to let them achieve truly net zero energy buildings at reasonable cost.

### Sustainable development approach of the project owner

A global approach was adapted for this experimental building to make it a real sustainable development project easily reproducible under normal conditions of a construction site.

The major adopted axes were as follows:

Wooden framework for carbon sink, reduce grey energy and a lightweight building being adaptable to different types of terrain

Crawl space to limit soil sealing and to limit the use of concrete

Pre-fabrication for limiting grey energy consumption (optimized material consumption, limited movements) and waste under control (green construction site). The pre-fabrication also allows excellent quality control during the construction stage and thus ensuring the achievement of high-level projects, especially in terms of airtightness. This quality is reflected in the long term by low real energy consumption.

Balance between cost / products used to optimize the budget and the real consumption

Only use of electrical energy in the building to limit the proliferation of energy supply networks (no gas network). Despite unfavorable primary energy results, the electrical energy has a much better GHG assessment than the gas. The electrical connection is anyway required.

## Architectural description

To maximise the benefits of free energy intake, Vermont house is a compact and bioclimatic building. The main facade is oriented south to maximize solar gain and technical rooms are oriented north to be used as buffer zones.

## Building users opinion

The building is used as an office by the company and is occasionally inhabited. The thermal comfort is exceptional with a perfect temperature homogeneity thanks to the insulation quality and triple-glazed windows. Very nice brightness. Sense of well-being in the building. Low dust and no allergy during the pollen period. Very pleasant summer temperature and automatic control systems for managing building temperature. The average thermal inertia allows a quick refreshment during the night ventilation.

## If you had to do it again?

Potential improvements were incorporated into the evolution of the ECOXIA Smart Envelope.

The house is a one-storey building with a roof terrace. The choice of a dual-slope roof would have to win a few meters square without significant additional cost and would have improved the energy balance per m<sup>2</sup>.

## See more details about this project

<http://www.ecoxia.fr>

<http://www.facebook.com/ecoxia>



## Stakeholders

### Stakeholders

Function : Contractor

Ecoxia

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Conceived by

### Contracting method

Other methods

## Energy

### Energy consumption

Primary energy need : 47,60 kWh/m<sup>2</sup>.an

Primary energy need for standard building : 62,40 kWh/m<sup>2</sup>.an

Calculation method :

CEEB : 0.0001

Breakdown for energy consumption : On 2014: Hot water-Ventilation: 22.29 Extra heating: 2.86 Lighting: 3.48 Other: 6.84

These consumptions do not include photovoltaic production. Photovoltaic production is in the order of 2500kWh / year, 23kWh / m<sup>2</sup> / year. With 30 to 40m<sup>2</sup> of solar panels, we can completely cover all the energy needs (specific and non-specific needs).

### Real final energy consumption

Final Energy : 35,47 kWh/m<sup>2</sup>.an

Real final energy consumption/m2 : 35,47 kWh/m<sup>2</sup>.an

Real final energy consumption/functional unit : 35,47 kWh/m<sup>2</sup>.an

Year of the real energy consumption : 2 014

## Envelope performance

Envelope U-Value : 0,58 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

The Vermont house envelope incorporates the 1st generation of ECOXIA Intelligent Envelope.

So this is a wood frame house with a vertical walls insulation with the system of Structural Insulated Panels (SIPs) , triple glazing, floor insulation and coffered ceiling with cellulose wadding. The envelope was made in the workshop in the form of three pre-fabricated 3D modules and transported by truck on site. The assembly of the three modules took a few hours.

Building Compactness Coefficient : 0,80

Indicator :

Air Tightness Value : 0,22

Users' control system opinion : Domotic systems installed in the building allows:

record real consumption of the building on all posts and bring them closer to actual outdoor weather conditions

to measure the indoor temperature and relative humidity in each room of the house and so measuring comfort for the people

- to remotely control the rolling shutters and thus optimize free inputs (shutters opening in the winter to let the sun in or sun protection in summer). Finally, after two years of domotic use, we can follow if excessive consumption occurs and make adjustments. The shutters control in summer helps to control the temperature inside the building and so remove any cooling system (reversible heat pump) for the real comfort of the inhabitants.

## More information

Actual consumption is measured with counters dedicated to each posts (finder). The consumption is recorded every 20 minutes which optimizes the settings (if necessary). The setpoint temperature is 20 ° Celsius. The building's real consumption are analyzed in detail since July 2013.

## Renewables & systems

### Systems

Heating system :

- Heat pump
- Radiant ceiling

Hot water system :

- Heat pump

Cooling system :

- Reversible heat pump

Ventilation system :

- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic

Renewable energy production : 120,00 %

Other information on HVAC :

HORA 4-in-1 system : double flow heat exchanger with an integrated «PAC» reversible system, air heating systems and radiant ceiling panels

20m<sup>2</sup> of solar panels (3kWc) installed. This area covers the building's energy needs. A system of about 30 to 40m<sup>2</sup> can cover all building uses

Solutions enhancing nature free gains :

Excellente étanchéité à l'air, larges ouvertures au sud

## Smart Building

BMS :

System developed with the CRITT Bois d'Epinal for consumption measures, indoor and outdoor temperatures, humidity, sunlight etc ... Integration of a control system through radio waves for lights management.

Smartgrid :

All photovoltaic production is fed back into the network

Users' opinion on the Smart Building functions : See comments in the ENERGY

## Urban environment

The house is located in a residential area near a wood.

The wooden cladding allows to improve the natural environment of the neighborhood. Being located in proximity of a hiking trail, the building attractiveness is confirmed by many walkers visits.

## Products

### Product

ECOXIA Intelligent Envelope

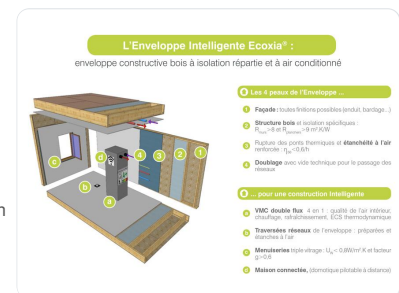
ECOXIA

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Product category : Gros œuvre / Système passif

ECOXIA Intelligent Envelope is a constructive solution that includes all items related to the energy performance of the building. It includes bioclimatic design of the building (including calculations and performance optimization in the PHPP software) and the realization in the workshop of the envelope: ceiling, floors, walls, woodwork and the integration of the ventilation system and of home automation systems.



ECOXIA Intelligent Envelope allowed the realization of a building with exceptional real energy performances and well-managed costs. The experience of the Vermont House has improved the solution of the Intelligent Envelope.

Enveloppe Intelligente

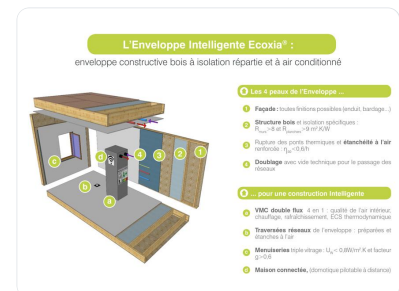
Ecovia

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<http://www.ecoxia.fr>

Product category : Gros œuvre / Système passif

L'enveloppe intelligente d'ECOXIA est une solution innovante qui permet aux petits constructeurs (CMistes, promoteurs, architectes) de réaliser des bâtiments passifs (et donc BEPOS avec un équipement EnR raisonnable) avec une certitude de résultat et des coûts parfaitement maîtrisés. L'Enveloppe Intelligente (EI) d'ECOXIA se positionne comme le guichet unique de la sobriété énergétique. L'EI est le macro-lot bois, en conception et réalisation, qui regroupe tous les lots qui font la performance énergétique réelle. L'EI permet de construire 2 à 3 fois plus écologique qu'aujourd'hui, grâce au bois (puits de CO<sub>2</sub>) et au passif (sobriété énergétique). D'un point de vue sociétal, ECOXIA élargit l'offre de logements, de qualité, et améliore les conditions de travail des ouvriers (préfabrication). Pour des petits projets (1 à 10 logements), notre solution de clos-couvert passif ventilé (hors d'eau hors d'air + CVC) revient à 600-800€/m<sup>2</sup>. Nos partenaires constructeurs de maisons individuelles sont ainsi capables de commercialiser des maisons d'architecte, bois, passives à moins de 2000€/m<sup>2</sup> TTC clef en main.



L'EI permet aux petits constructeurs de répondre aux prochaines réglementations, complexes et techniques, RBR 2020 (France) ou NZEB (UE). C'est donc une solution qui permet aux petits acteurs de rester compétitifs sur le marché de la construction. Bien que préfabriquée, la solution permet de réaliser des bâtiments personnalisés, avec des architectures qui correspondent à l'identité des maîtres d'œuvre et des maîtres d'ouvrage. La solution peut s'intégrer dans tout petit bâtiment. L'Enveloppe Intelligente est commercialisée depuis 2015. Elle est conforme à tous les DTUs et normes dont elle relève. ECOXIA dispose de toutes les accréditations nécessaires (RCP, RCD, JEI, CEPH...). L'outil de production est volontairement en France.

## Costs

### Construction and exploitation costs

Renewable energy systems cost : 14 000,00 €

Total cost of the building : 200 000 €

### Energy bill

Forecasted energy bill/year : 600,00 €

Real energy cost/m<sup>2</sup> : 5.45

Real energy cost/Dwelling : 600

### Indoor Air quality

The quality of indoor air is ensured by a double flow heat exchanger with integrated filters. The prefabrication in workshop has also helped to maximize the degassing phase of new materials. A major effort was also made on finishing materials - only products with the best IAQ rankings were chosen (fermacell, painting, coatings ...)

### Comfort

**Health & comfort :** Extended building studies realized independently by CRITT BOIS EPINAL allowed to put forward a high degree of thermal comfort and of brightness in the building. The experience of building users is also reflected in a significant reduction of allergy crises in the building and a sense of well-being increased in winter thanks to the excellent brightness.

**Calculated thermal comfort :** Le confort mesuré par le CRITT BOIS d'EPINAL (Essai n°2011\_699 de septembre 2014) fait apparaître sur la période d'été plus de 72% des heures en "grand confort" et moins de 1% en "inconfort"

**Measured thermal comfort :** Grand confort en hiver (excellente isolation thermique, uniformité des températures de l'air et des parois) et en été (pas de surchauffe les jours de grande chaleur) attesté par les mesures thermiques réalisées dans le bâtiment

**Acoustic comfort :** Acoustic comfort compared to outside is maximized thanks to an excellent air tightness and use of triple glazed windows. Sound insulation DnT, A, tr (dB): 34

## Carbon

### GHG emissions

**GHG in use :** 2,00 KgCO<sub>2</sub>/m<sup>2</sup>/an

**Methodology used :**

Conversion of the overall consumption of 35,47kWh with the coefficient 0.084 kg eq. CO<sub>2</sub> / kWh of final energy for electricity

**GHG before use :** 102,00 KgCO<sub>2</sub> /m<sup>2</sup>

**Building lifetime :** 100,00 année(s)

**, ie xx in use years :** 51

Calculation by CRITT Bois d'Epinal

## Contest

### Reasons for participating in the competition(s)

Specifically, the Vermont house is defined as:

- A wooden house with optimized insulation and perfect airtightness allowing very low energy consumption, measured over time
- A connected house able to measure the real building's performances + remote control to optimize the consumptions
- A passive type construction and positive energy house (20m<sup>2</sup> of solar panels installed)
- The indoor air quality is optimized with a material selection and installation technology protecting the health of its inhabitants.
- A very comfortable house, in both summer and winter

### Building candidate in the category



Smart Buildings





Bâtiment zéro énergie



Santé et confort

