Passivhaus VIDEIRA

by Mike Lehmhaus / 2015-03-09 00:00:00 / España / 16639 / ES

Primary energy need :

55.26 kWhpe/m².year

(Calculation method : RD: 47/2007)

ENERGY CONSUMPTION

Economical building

< 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 **A**

Building Type : Isolated or semi-detached house
Construction Year : 2011
Delivery year : 2012
Address 1 - street : Coiro 36947 CANGAS DO MORRAZO - PONTEVEDRA - GALICIA, España
Climate zone : [Csb] Coastal Mediterranean - Mild with cool, dry summer.

Net Floor Area : 162 m²
Construction/refurbishment cost : 250 000 €
Number of Dwelling : 1 Dwelling
Cost/m2 : 1543.21 €/m²

Proposed by :

CASADOBE ARQUITECTURA
ESTUDIO DE ARQUITECTURA Y REHABILITACIÓN

CASADOBE ARQUITECTURA
ESTUDIO DE ARQUITECTURA Y REHABILITACIÓN

General information

It is a detached house designed under both the Passivhaus standard and bioclimatic criteria in order to achieve an highly energy efficient housing, with a nearly zero energy consumption. Furthermore bio-construction criteria are also followed, using both materials and structural systems that have low environmental impact.

At the beginning the project design tried both to recovery and to increase the existing house on the plot. Nevertheless due to its need of being repair and the high cost of the rehabilitation the house was demolished. But on the other hand the decision of keeping the design of the original volume was made due to no lose time with a new permission approval.

The house extension is solved with an additional compact volume attached to the existing one. Pointing the living room and the rooms towards the south and the garden. The new volume has a flat greenroof and the elevations have different features (depending on their use and their guidance) looking for making a difference with the existing building, showing his evolution.

The main milestone of this work was the possibility of making a passive house.

See more details about this project

http://www.casadobe.es/
https://www.facebook.com/media/set/?set=a.217574198299775.50969.158976774159518&type=3

Data reliability

Assessor

Stakeholders

Stakeholders

Function : Designer

Mike Lehmhaus

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Author of the project and construction management.

Function : Others

Cristobal Brañas Pena

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Quantity surveyor

Contracting method

Other methods

Owner approach of sustainability

The architect, Mike Lehmhaus (from CASADOBE Architecture Studio), was contacted by the client to develop the project of the rehabilitation and the extension of his future home in 2008. The works of the Studio are guided forwards to the construction of buildings with: low energy demand, almost zero consumption and being respectful with the environment. Being one of the precursors of "Passivhaus Standard" in Galicia. For this reason the Studio proposed the owner the developing of an Passivhaus. He accepted. Besides bioclimatic measures to take advantage of the solar gains, the use of materials and construction systems to achieve a low environmental impact was done.

Architectural description

It is a detached house located in the parish of Coiro, in the town of Cangas (Pontevedra - Galicia). The plot has an area of 714m² of which the house occupies an ground area of 117m². It has also: an open garage zone and some cobbled path to access both the garage and the house. The rest of the plot is a garden. The dwelling consists in two volumes. At the beginning it was intended to rehabilitate the existing building and to add a module made of wood. But when the work gets started, it was proved that would be cheaper to demolish and to build a new house rather than to preserve the existing one. Despite this, in order to avoid a delay in the work, the initial project was maintained. It means that both the look and the size of the demolished house were respected. The new rectangular two-storey volume was resolved with light frame wood and cellulose and a flat green roof with extensive vegetation. The interior is designed in order to meet the needs expressed by the builder family. The property, on the ground floor, has: an open room for the kitchen-dining-living room, two bedrooms, a bathroom, a laundry room and an outdoor terrace. Upstairs there is a master bedroom, a bathroom and another space prelude to the other ones, which is used as an office. Also on this floor there is an garret, which is used as an attic. The materials used include: wood, cellulose, wood fiber panels, viroc, thermo-clay bricks, EPDM membrane, linoleum, a vapour check and airtightness membrane. Moreover wood windows with triple glazing low-e glass and warm edge spacer. It also has a vegetal roof that improves the isolation therefore enhance energetic efficiency of the building and helps to improve the microclimate (dedusting, water retention, living space, temperature reduction, ...)

If you had to do it again?

If the option of demolishing the existing house had been considered from the beginning, the design of the new house would have been modified to suit better the customer needs.

A Blower Door Test would be done in the execution phase of the project so it is more accessible to resolve existing infiltrations.

With the first storm, the cover waterproofing showed an untraceable leakage. Therefore, the client decided to put a sloping cover with a direct drain. In future flat covers, the constructive solution must be simplified as well as to increase the control of the execution.

Placing the wood fiber panel in the sloping cover is fragile and needs to be covered sooner, immediately.

As expected, there was overheating in the living room and master bedroom. Unexpectedly in the attic. To resolve the external protection measures were taken, that could have been integrated from the outset.

Building users opinion

The building was finished in August 2012 and the clients moved into the house in September. Since then, and because inhabiting a house means to test it, there have been small improvements.
After the first year there are two significant figures which illustrate this experience: 21° C constant internal temperature throughout the year and 75% reduction in terms of electricity consumption per m² compared with the previous domicile.

Energy

Energy consumption

Primary energy need : 55,26 kWhpe/m^2.year

Primary energy need for standard building : 112,39 kWhpe/m^2.year

Calculation method : RD: 47/2007

Final Energy : 46,17 kWhfe/m^2.year

Envelope performance

Envelope U-Value : 0,19 $W.m^{-2}.K^{-1}$

More information :
The entire thermal envelope was designed and built according to the “passivhaus” standard criteria.
-Walls:
- LHD-brick and thermo-clay U: 0.19 W/(m²K)
- Light Wood Framing U: 0.19 W/(m²K)
-Windows Wood with triple glazing Ug: 0.6 W/(m²K)
-Green roof U: 0.19 W/(m²K)
-Tile roof U: 0.23 W/(m²K)
-Floor U: 0.19 W/(m²K)

Building Compactness Coefficient : 1,02

Indicator : n50

Renewables & systems

Systems

Heating system :
- Others

Hot water system :
- Individual electric boiler
- Solar Thermal

Cooling system :
- Canadian well

Ventilation system :
- Natural ventilation
- Double flow heat exchanger
- Canadian well

Renewable systems :
- Solar Thermal

Renewable energy production : 80,00 %

Other information on HVAC :
Heating system:

It has not got a traditional heating system. A biomass stove is installed in the living room and the house also has radiant mirrors in the bathrooms for extra input/contribution in case of necessity. The ventilation system is in charge of the heat distribution.

Refrigeration system:
No traditional refrigeration system is installed.

Ventilation system:
-Cross ventilation in all rooms. It gives advantage to natural and fast ventilation without energy consumption.
-Mechanical monitored ventilation system with heat recovery and summer bypass. Air intake pre-treatment is done through a Canadian well (surface to air exchanger) which reduces the need for either post heating or cooling. Also with this ventilation system the air is filtered and the interior humidity levels are controlled.

Hot water system
-Solar Thermal Energy: This system is designed for the domestic hot water (DHW) production. It has an annually solar contribution of 80%. It has two high performance integrated solar collectors with a total area of 3,6m²; with an inclination of 31° south and a stratified accumulation deposit of 450 liters that is independent of the drinking water circuit. To solve problems of stagnation and overheating a drain-back system is used.
-Electric water heater: to cover the remaining demand.

Environment

GHG emissions

GHG in use : 3,68 $KgCO_2/m^2$/year

Methodology used :
CALENER-VYP

Building lifetime : 50,00 year(s)

Indoor Air quality

Ventilation flow rates are achievable according to the Table 2.1. HS3-CTE. The ventilation system is mechanical with a heat recovery system. The ventilation is continuous at very low speed, which ensures an optimal air quality without creating any discomfort. The recovery system takes advantage of the 85% of the energy that comes from the interior hot air before being expelled. Its consumption is very low and its maintenance only requires the replacement of the filters located at both air outlets and in the entrance of the earth to air heat exchanger (canadian well).

Products

Product

Lamina Intello

ProClima

Polígono Ibarrea s/n E-31800 Alsasua (NAVARRA) Tlf. 948 564 001 - Fax 948 564 230 - Email: biohaus@biohaus.es

http://www.biohaus.es/; http://www.proclima.com/

Product category :

INTELLO®: Vapour check (and airtightness) membrane with wide range of variable diffusion resistance: In cold weather high protection from condensation (sd - value > 25 m), whilst in summery weather they have very high permeability (sd approx. 0.25 m) for back-diffusion.

Membrane: Polyethylene copolymer
Fleece: Polypropylene
Water vapour resistance factor µ: 37.500
Thickness: 0,2 mm
sd-value: 0,25 m- 25 m variable
Fire behaviour: E
Temperature resistance: from -40 C until + 80 C
Colour: white-transparent
CE labeling (EN 13948)

Workers have no awareness of the need of the membrane and its importance. It is difficult for them to follow the guidelines of the construction management.

Biocell

Biohaus

Polígono Ibarrea s/n E-31800 Alsasua (NAVARRA) Tlf. 948 564 001 - Fax 948 564 230 - Email: biohaus@biohaus.e

http://www.biohaus.es/

Product category :

Cellulose as insulation material is a recycled product from newspaper which is undergoing to a full process of grinding, shredding and treating with boric sales that cover the “flakes”, generating an effective protection against fire and parasites.
It is applied with a machine that blows the product inside of the gaps. As thermal, acoustic and fire-fighting protective insulation, cellulose can be used in the filling of chambers decks, floors, dividing walls, facades, etc.

Mechanical and physical characteristics:
- Coefficient of thermal conductivity: 0,037 W/(m·K)
- Settling: 4%
-Ph: 7,7
- Water vapour resistance factor: 1-2µ
-Reaction Fire. Class B2
-Specific-heat: 2100 J/(kg·K)
-Mold growth: Level 10
-Humidity: 10%
-Energy Contained: 58 kWh/m²

Heat recovery unit

Zehnder

Zehnder Group Ibérica Indoor Climate, S.A. C/ Argenters, 7 Parque Tecnológico 08290 Cerdanyola del Vallés Barcelona Tlf. +34 902 106 140 Fax +34 902 090 163 - Email: info@zehnder.es

http://www.zehnder.es

Product category :

The Zehnder ComfoAir 350 ventilation units control both the intake and extract air of the ventilation system. Thanks to the control unit, easy to use, it is easy to adjust the quantity of air that is needed. All units are fitted with a filter as standard, fine and pollen filters can be retrofitted.
-Comfort ventilation for duties up to 370 m³/h
-Heat recovery with an efficiency of more than 90%
-Low power consumption thanks to DC motors
-Automatic 100% summer bypass
-Frost protection function: efficient even at low temperatures
-Quick, safe installation and servicing
-Wireless remote control and filter replacement indicator
-Geothermal heat exchanger control

Good acceptance by all actors.

Costs

Construction and exploitation costs

Renewable energy systems cost : 23,50 €

Total cost of the building : 250 000 €

Urban environment

The house is located in the parish of Coiro, a few kilometers from the town center of Cangas do Morrazo, in Galicia (north-west Spain) so it has all kinds of services. Although Coiro fundamentally and socially is an interior parish, on its coast is located the busiest beach of the town, Rodeira, because this is the closest beach from the village center. Furthermore this area is complemented by other two smaller an almost unknown beaches: Alemanes and Canaval. Coiro is located on the eastern edge of the municipal territory, on the border with Moaña. Inland, Coiro keeps marvellous natural corners, some of them declared Protected Natural Areas (as Carballeira of Coiro, which is a typical Atlantic forest that is plentiful of oaks, carballo in Galician, alders and birches). The Bouzo River completes a space where, as in all the rivers and streams of these lands, many mills, more or less, remains preserved. This is because some of them have been used until relatively recently time, as Fausto mill which has been restored so people can see how it works. Moreover in Coiro grow up important families that became part of the rural aristocracy, as Mondragón family, as well known as The Marquis of Santa Cruz de Rivadulla. It means that there are numerous luxurious country houses (pazos in Galician) and emblazoned buildings. Among this Pazos the most famous are A Retirosa and O Xistro. The church of San Salvador is also an interesting monument which highlights the disproportionate of its baroque tower. With regard to communications by road, there is the AP-9 (Atlantic Highway) that, through the Morrazo Corridor and the Rande Bridge, connects the Morrazo area with Vigo (the Galician biggest city); all the southern part of Galicia; the plateau and Portugal. One of the AP-9 branches is the PO-551, a provincial highway, which connects Cangas with Moaña. Another branch, the PO-315, connects Cangas with Bueu. Once there, in Bueu, you go to Pontevedra, the capital of the province, by a highway that passes nearby Marín. Moreover there are countless roads that connect the different neighborhoods that put together the municipality. Regarding to the public transportation, the neighborhood does not have this service.

Although there are intercity buses that link Cangas with the neighboring towns. These buses also go directly to Pontevedra. Ship communications are well developed. The maritime terminal is just a few meters from the bus station. It is a good example of “intermodal station” because this is one of a few in Spain that combines both sea and ground transportation.

Land plot area

Land plot area : 713,68 m^2

Built-up area

Built-up area : 18,00 %

Parking spaces

One double garage within the plot is constructed.

Building Environnemental Quality

Building Environmental Quality

- Building flexibility
- indoor air quality and health
- biodiversity
- acoustics
- comfort (visual, olfactive, thermal)
- energy efficiency
- renewable energies
- integration in the land
- products and materials

Contest

Reasons for participating in the competition(s)

Edificio de consumo casi nulo:
Casa Videira es una vivienda unifamiliar diseñada bajo el estándar Passivhaus, con una demanda de calefacción de 10 kWh/m ^{2}año. Además, se diseña siguiendo medidas bioclimáticas maximizando el aprovechamiento de las ganancias solares.

Con estas medidas alcanzamos la calificación energética A:

-Consumo teórico de energía primaria: 55,26 kWh/m^2año

-Emisiones CO2: 3,68 kgCO_2/m^2año

Toda la envolvente se diseña con una baja transmitancia térmica y minimizando los puentes térmicos:

- Cerramiento fachada: 0,19 W/m^2K
- Suelo: 0,20W/m^2K
- Cubierta: 0,23 W/m^2K
- Cubierta ajardinada: 0,19W/m^2K

Las ventanas son de altas prestaciones con vidrios bajo emisivos, con borde caliente y U_g<0,6W/m^2K.

Se instala un sistema de ventilación mecánica controlada con recuperación de calor, con la que se consigue aprovechar un 85% de la energía del aire caliente del interior.

Energías renovables:

Se instalan dos *captadores solares térmicos* en el faldón Sur de cubierta que cubren el 80% de la demanda anual de ACS.

Al ser una casa pasiva la vivienda no requiere de un sistema tradicional de calefacción.Se instala una *caldera de biomasa* para tener un aporte adicional en caso de necesidad.

La vivienda dispone de un sistema de ventilación controlada con recuperación de calor. Para mejorar la eficiencia de este equipo se

realiza un pretratamiento en la admisión de aire a través de un *pozo canadiense* (intercambiador tierra-aire).

Materiales de origen biológico:

Se busca la utilización de materiales y sistemas constructivos que supongan un bajo impactomedioambiental.

Los forjados del volumen principal son de madera y los cerramientos de termoarcilla. Adosado a éste se diseña un volumen compacto usando sólo madera. También encontramos madera en la carpintería, tanto interior como exterior, pavimentos, terrazas,...

Tanto en la cubierta inclinada como en los cerramientos del volumen de madera se usan paneles de fibra de madera.

Como aislamiento térmico se utiliza copos de celulosa de papel reciclado, insuflado en la cámara de los cerramientos y forjados.

Salud y confort:

Elevada calidad del aire interior por el sistema de ventilación de doble flujo. Es una ventilación continua y a muy baja velocidad con lo que no crea disconfort, filtra y calienta el aire exterior, controla los niveles interiores de humedad.

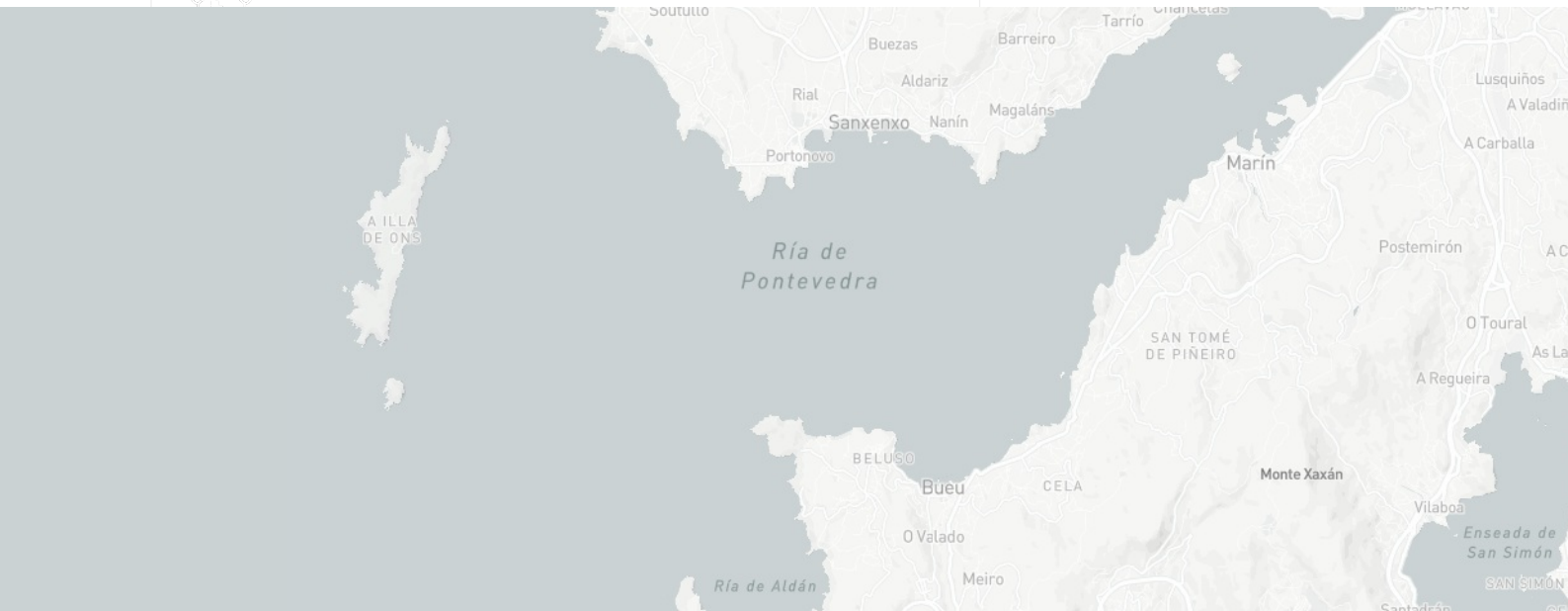
Al ser una vivienda pasiva, se garantiza un confort térmico interior por minimizar el contraste entre la temperatura del aire y la de la envolvente. Debido a tener una temperatura superficial de la envolvente interior superior a 18°C en invierno.

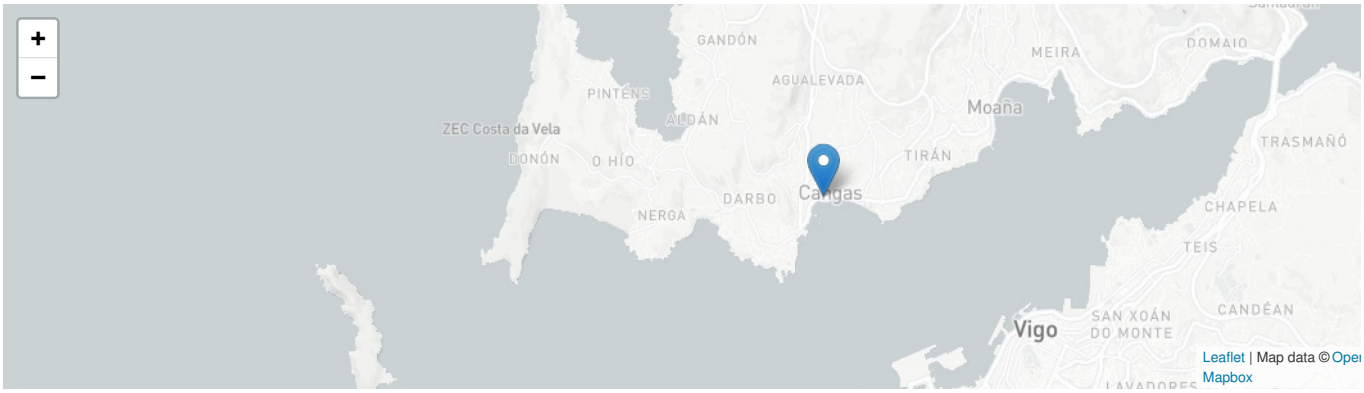
Se diseña en volumen de madera una cubierta vegetal que mejora el aislamiento y ayuda a mejorar el microclima (captación de polvo, retención de agua, espacio de vida, reducción de la temperatura...)

Building candidate in the category

Materiales de origen biológico

Energías renovables





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