

## Refurbishing with active facade

by Josep Bunyesc Palacín / 2017-06-01 10:45:18 / Espagne / 9925 / ES



**Building Type** : Isolated or semi-detached house

**Construction Year** : 2014

**Delivery year** : 2014

**Address 1 - street** : 25518 PESSONADA, CONCA DE DALT, España

**Climate zone** : [H] Highland Climate(mountainous terrain).

**Net Floor Area** : 180 m<sup>2</sup>

**Construction/refurbishment cost** : 68 163 €

**Number of Dwelling** : 1 Dwelling

Cost/m<sup>2</sup> : 378.68 €/m<sup>2</sup>

## General information

In this project, an old house became passive or very low energy consumer thanks, above all, to the intervention carried out on the south façade to achieve interior comfort, capturing the heat of the sun and slowly transmitting it to the interior: turning the south façade into an active façade. The original state was a building of uninsulated stone walls, a fairly closed southern facade and of poor structural quality, with small windows and a new but uninsulated roof.

Author of the images: Stella Rotger and Josep Bunyesc

## Data reliability

Self-declared

## Stakeholders

### Stakeholders

Function : Designer

Josep Bunyesc

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<http://bunyesc.com/projectes.html>

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Function : Construction Manager

Isara

630722734

## Contracting method

Separate batches

## Owner approach of sustainability

Neighbor of the town, with sensitivity in environmental criteria and motivated towards actions and actions that reduce energy consumption without deteriorating the environment.

## Architectural description

In this project, an old house became passive or very low energy consumer thanks, above all, to the intervention carried out on the south façade to achieve interior comfort, capturing the heat of the sun and slowly transmitting it to the interior. The original state was a building of uninsulated stone walls, a fairly closed southern facade and of poor structural quality, with small windows and a new but uninsulated roof. Due to the poor state of the southern façade, windows could not be made much larger than the existing ones. It was difficult to capture solar energy passively inland. In order to capture energy through the opaque part of the façade, 8-ply polycarbonate panels were installed on the exterior, which made the southern facade a large passive solar collector and, consequently, its old stone wall turned into an accumulator wall and passive radiator in the interior of low temperature and of great surface. The rest of the walls and cover were insulated by the interior.

## Building users opinion

Surprised before the good functioning of the rehabilitation and aware of the great margin of improvement of the construction system and traditional built park.

## Energy

### Energy consumption

Primary energy need : 14,00 kWhpe/m<sup>2</sup>.year

Primary energy need for standard building : 76,70 kWhpe/m<sup>2</sup>.year

Calculation method : Other

CEEB : 0.0009

Initial consumption : 170,00 kWhpe/m<sup>2</sup>.year

### Envelope performance

Envelope U-Value : 0,22 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

Except for the southern façade, the perimeter of the façades is insulated in the interior with

reclining cotton of 12 cm of thickness. The cover is insulated with recycled cotton between the wooden beams. In the south façade, a polycarbonate is chosen for the exterior of 4 cm of thickness and a U of 1.1 W / m<sup>2</sup>K and a factor G of 0,6. It is an active insulation, which allows to capture, in winter, much more energy than it lets out.

Building Compactness Coefficient : 1,20

Indicator :

Air Tightness Value : 2,50

## Real final energy consumption

Real final energy consumption/m<sup>2</sup> : 32,00 kWhfe/m<sup>2</sup>.year

Year of the real energy consumption : 2 015

## Renewables & systems

### Systems

Heating system :

- Others
- Wood boiler

Hot water system :

- Other hot water system

Cooling system :

- No cooling system

Ventilation system :

- Natural ventilation
- Nocturnal ventilation
- Double flow heat exchanger

Renewable systems :

- Wood boiler
- Other, specify

Other information on HVAC :

On days when there is no sun, there is not enough passive energy provided by the southern façade, so an extra supply of heat is needed. This heat is provided by a wood stove that feeds on local firewood. The stove is located on the ground floor of the house and thus heats the entire building.

## Solutions enhancing nature free gains :

South facade with polycarbonate outside as finish and solar energy collector to heat the existing wall and that it radiate the energy to the interior of the house.

## Environment

## Comfort

Calculated thermal comfort : 19-25°C

Measured thermal comfort : 19-25°C

## Products

## Product

Active polycarbonate facade

Aislux

AISLUX CATALUNYA, S.A. Polígono Ind.  
CAMP DE LA SERRA C/Progreso, 3 08784  
HOSTALETS DE PIEROLA (BCN) Tel.: 93  
771 26 00 Fax.: 93 771 25 45  
catalunya@aislux.com

<http://aislux.com/aislux/>

Product category :

The southern façade is the only surface that has more solar incidence in winter than in summer.

In the northern hemisphere of the planet, winter solar radiation has an angle of incidence quite perpendicular to the wall, but during the summer the sun is much higher and affects less in the vertical plane of the southern façade.

The incidence in summer is much lower and combined with the effect of light reflection on the polycarbonate there is virtually no refracted solar radiation or visible radiation entering the wall in summer: the wall is not heated when the sun is high or summer. On the



other hand, the wall is well heated when the sun is low because there is little reflection and much refraction to the interior of the wall. Luckily this physical phenomenon allows to give the wall much energy in winter and very little in summer. This allows the wall to be used as a heat radiating surface in winter and without damaging it in summer. As will be seen in the graphs of the solar contribution, this contribution of energy is proportional to the demand for heating throughout the year.

Under the prescription of the solution by the architect, the property agreed to negotiate a trial period before accepting it as final. This was the first test of the product, so, given the success, it has later been implemented in different projects.

## Costs

### Construction and exploitation costs

Cost of studies : 3 400 €

Total cost of the building : 68 163 €

### Energy bill

Forecasted energy bill/year : 400,00 €

Real energy cost/m<sup>2</sup> : 2.22

Real energy cost/Dwelling : 400

## Urban environment

It is a small mountain village of 52 inhabitants which belongs to the municipality of Conca de Dalt. The property is located on one of the main streets, northeast of the town. It is surrounded by single family dwellings between middles, like the one presented in this case study.

### Land plot area

Land plot area : 346,00 m<sup>2</sup>

### Built-up area

Built-up area : 32,70 %

## Building Environmental Quality

### Building Environmental Quality

- Building flexibility
- indoor air quality and health
- comfort (visual, olfactive, thermal)
- energy efficiency
- products and materials

## Contest

### Building candidate in the category



Energía & Climas Temperados



Bajo Carbono





**Salud & Comodidad**



**Premio de los Usuarios**