casa pasiva LYNAM passivhaus

House for a family in Lasarte, Vitoria-Gasteiz (Álava) SPAIN

Designer Javier Crespo Ruiz de Gauna, architect www.arkearquitectos.com

It is a single storey house for a couple with two daughters. It is located in the village of Lasarte, 4 km from the city center of Vitoria. The house opens to the 4 orientations, although the bigger hollows are arranged to the southwest, towards the Montes de Vitoria.

Special features: active heat inputs are achieved through a pellet stove, electric towel rails and low-power radiant panels.

<table>
<thead>
<tr>
<th>annual heating demand PHPP EP no renov.</th>
<th>pressure test n50</th>
<th>PHPP primary energy demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 kWh/m2a</td>
<td>0.6 r/h</td>
<td>84 kWh/m2a</td>
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</table>

| U-value exterior wall                  | 0.121 W/m2K      |
| U-value roof                           | 0.128 W/m2K      |
| U-value basement                       | 0.133 W/m2K      |
| U-value Uf frame (windows)             | 0.980 W/m2K      |
| U-value Ug glass (windows)             | 0.520 W/m2K      |
| Heat recovery                          | 95%              |
| Primary energy demand ren.             | 54 kWh/m2a       |
Construction task

It is a housing of 161 m2 of Energy Reference Surface, of a single plant, with a small attic whose use is the one of storage, for a pair with two daughters. It is located in the village of Lasarte, 4 km from the center of the city of Vitoria, at a height of 564 m above sea level.

![View of the facade that opens to the porch SO](image)

The house opens to the 4 orientations, although the bigger hollows are arranged to the southwest, towards the Montes de Vitoria. It has a good sunshine throughout the day and throughout the year, only partially affected by trees located on the other side of the access road (Artzua street).

![View of the facade](image)

The project has been carried out by Javier Crespo, Ana Ortiz de Landaluce and Nerea Ortiz de Landaluce architects of the ARKE arquitectos studio in Vitoria (Spain). The management of work has been carried out by Javier Crespo, architect and Oscar Fernández, quantity surveyor.

The energy calculations (PHPP, thermal bridges, development of facilities and construction details, etc.) have been carried out by Javier Crespo, architect.

Construcciones URRUTIA, with Iñaki Molina, as head of construction and Adelina Uriarte, specialist technician, as energy consultant, both Certified Trade Person.
The SUN: solar gaining and shadows

The housing is opened mainly to the southwest in order to capture the maximum solar contribution in winter. The gaps have been dimensioned to make the best use of the heat of the sun and its openings are designed to favor cross ventilation on summer nights. Blinds and slats have been provided for the sun protection and the luminous control of the rooms.

An open porch with wood structure opens to the southwest with the idea of arranging awnings that run between the rafter and generate a versatile outdoor space throughout the year.

A careful study of the route of the sun and its incidence throughout the year and of the day has been carried out in order to optimize the best catchment and shade strategies.

![Travel of the sun at the spring equinox](image)

INSULATION

The slab is insulated with 240 mm of XPS on its underside.

The thermo-clay is extruded to the outside with a 160 mm neopor (BASF) ETIS with acrylic mortar plaster and insulation with 60 mm mineral wool insulation, air chamber and laminated plasterboard (LP).

The cover is insulated with 320 mm thick wood fiber blankets placed between the rafters and with rigid panels of 35 mm wood fiber (GUTEX TOP multiplex) as support of the double cracked and the tile. The inside is cover with LP.

THERMAL BRIDGES

The insulation of slab, facade and roof is provided in continuity to minimize thermal bridges and the envelope is only traversed by the main wooden beams of the roof structure whose incidence in energy calculations has been conveniently considered in PHPP.
Exterior pictures

West view, with porch in the foreground

View from the South
casa pasiva LYNAM, Lasarte, Vitoria, España

South-East: Housing access elevation

North-West: Rear elevation
Interior pictures

The living room, with the pellet stove in the foreground

Distributor hall

Living room from the dining room

Main bathroom
Cross section

Floor plans

Overview of the plot
Construction PH details

Construction section: floor / facade / roof
Windows

High performance wood / aluminum windows certified PH (superconfort of VENTACLIM) have been installed with low transmittance of frames and triple glass with argon chamber and hot edge separators.

\[ U_1 = 0.98 \text{ W/m}^2\text{K} \]

\[ U_g = 0.52 \text{ W/m}^2\text{K} \]

\[ g = 0.50 \]
Airtight envelope: documentation of the pressure test

Airtightness in detail

Blower door test

AIRTIGHTNESS

The airtightness has been carried out by means of steam regulating sheets with variable SD (intello PROCLIMA) and the meetings between the different construction plans and of the ones with the perimeters of the carpentries with appropriate tapes (tescon vana PROCLIMA) have been solved to the different surfaces to which they had to adhere.

Blower Door tests were carried out during the works and concluded with a satisfactory result of 0.6 r / h, within the limits established by PH.
Ventilation plan for the ductwork and central unit specific values

CONTROLLED VENTILATION WITH HEATING RECOVER

A high-efficiency (95%) heat recovery (ZEHNDER confoAir 350 luxe) has been designed according to the volume of air to be treated in the house, with main ADMISSION / EXPULSION ducts and IMPULSION / EXTRACTION of polypropylene with 160 mm graphite diameter (ZEHNDER confoPipe), inlet and outlet distribution boxes with their corresponding silencers and conduits to the bedrooms and common rooms and extraction of bathrooms, toilet, office and kitchen. The electrical efficiency of the heat recovery is 0.29 W/m3.
Heat supply

Wooden pellet stove EDILKAMIN, model DAME of 6 kW of power

<table>
<thead>
<tr>
<th>Datos técnicos</th>
<th>min/max</th>
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<tbody>
<tr>
<td>largo</td>
<td>cm</td>
</tr>
<tr>
<td>profundidad</td>
<td>cm</td>
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<tr>
<td>altura</td>
<td>cm</td>
</tr>
<tr>
<td>potencia útil</td>
<td>kW</td>
</tr>
<tr>
<td>rendimiento</td>
<td>%</td>
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<tr>
<td>consumo de combustible</td>
<td>kg/h</td>
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<tr>
<td>pellet</td>
<td></td>
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<tr>
<td>capacidad depósito</td>
<td>kg</td>
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<tr>
<td>autonomía</td>
<td>h</td>
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<tr>
<td>Ø salida humos</td>
<td>cm</td>
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<tr>
<td>Ø toma de aire</td>
<td>cm</td>
</tr>
<tr>
<td>peso</td>
<td>kg</td>
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<tr>
<td>vol. calentable</td>
<td>m³</td>
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There are also 450W electric towel rails in bathrooms and 400W radiant panels in the bedrooms.
Report of PHPP results

**Construction costs**

1508 € / m²  
construction cost / living space (SRE)

**Costs for the building**

- 

**Year of construction**

February ... October 2016

**Information of the architectural design**

We start from a layout in plan of an earlier project of other architects. We regularize the spaces somewhat by forming two equal squares, slightly displaced so that the house opens slightly to the southwest. We set up a wooden roof that will bring a certain packaging to the house through the large beams that cross it and on which are supported wide eaves.
Information on the building services planning

In the office (installation room) an air-heat pump is responsible for supplying domestic hot water to the dwelling. In this room there is also the stove and a washing machine.

Information on the structural physics planning

The main insulation of the facade is EPS Neopor, with a low diffusion of the steam. The main insulation of facades is EPS with graphite, little open to the diffusion of steam and without capacity of hygrothermal control. To counteract this and given that the house consists of a single floor has been insulated with greater breathability as is the fiberboard on the deck, between rafters, and thus compensate for the deficit of the facade.

Information on the structural analysis planning

The building stands over a reinforced concrete slab laid over foundation wells supported on the resistant substrate.

On the slab a 29 cm structural wall of eco thermo-clay (cerámicas SAMPEDRO) rises.
On the wall is supported a structure of laminated wood (*cubiertas AOIZ*) formed by sleepers, beams and rafters of different sections.

**Experiences (user opinion, actual consumption values...)**

The house has just been occupied by their owners so there are no opinions or consumption values yet.

**Reference to existing studies/publications on this project**

There are no any studies/publication of the Project yet.