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*.

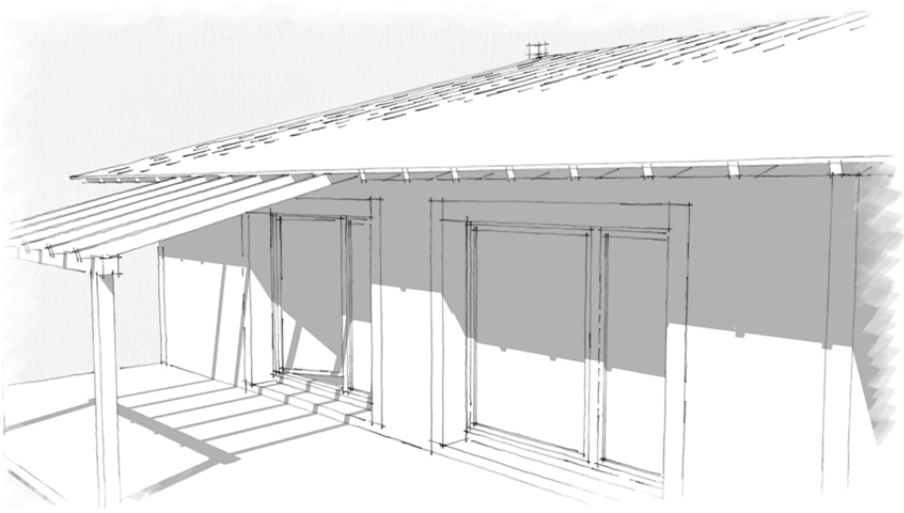
Special features: active heat inputs are achieved through a pellet stove, electric towel rails and low-power radiant panels.

anual heating demand PHPP EP no renov.	pressure test n_{50}	PHPP primary energy demand
15 kWh/m2a	**0.6 r/h**	**84 kWh/m2a**

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

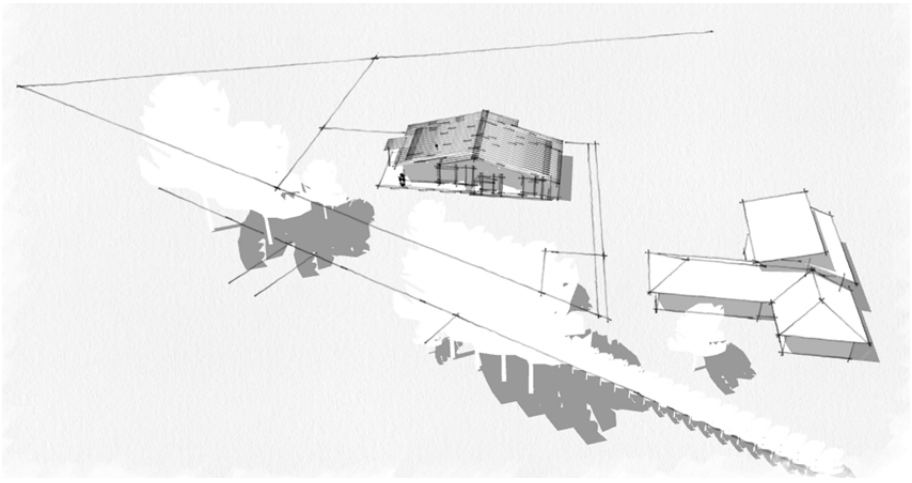
Construction task

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

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).



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.

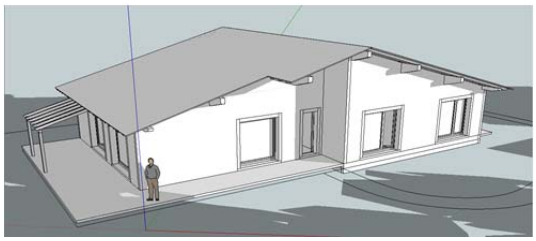
Construcciones URRUTIA, with Iñaki Molina, as head of construction and Adelina Uriarte, specialist technician, as energy consultant, both *Certified Trade Person*.

The SUN: solar gaining and shadows

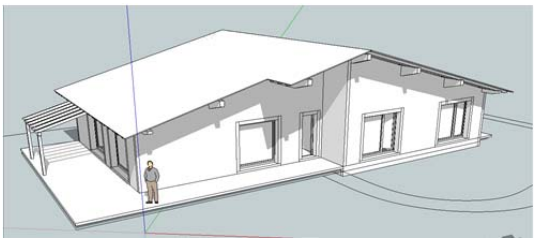
The housing is opened mainly to the southwest in order to capture the maximum solar contribution in winter. The gaps have been dimensioned to make the best use of the heat of the sun and its openings are designed to favor cross ventilation on summer nights. Blinds and slats have been provided for the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

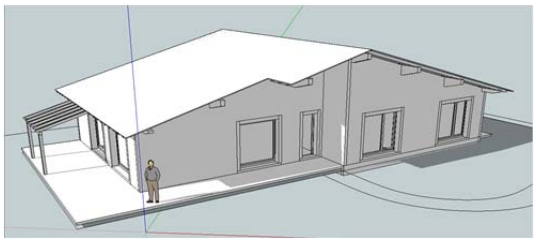
A careful study of the route of the sun and its incidence throughout the year and of the day has been carried out in order to optimize the best catchment and shade strategies.



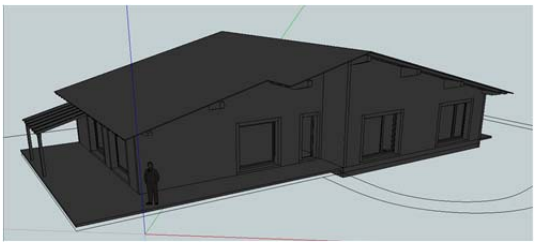
21/03 08:00



21/3 12:00



21/3 16:00



21/3 20:00

Travel of the sun at the spring equinox

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

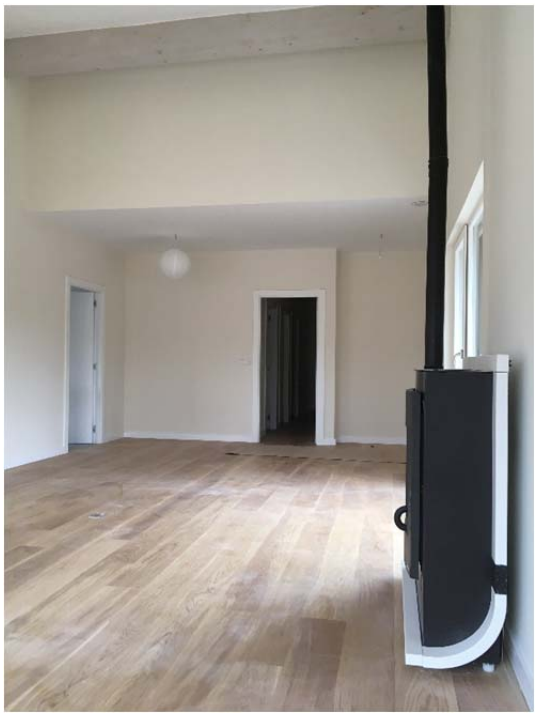
West view, with porch in the foreground

View from the South

South-East: Housing access elevation

North-West: Rear elevation

Interior pictures



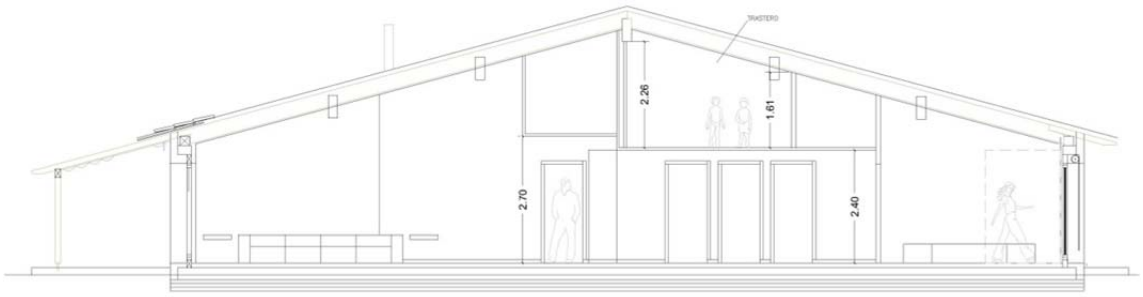
The living room, with the pellet stove in the foreground

Distributor hall

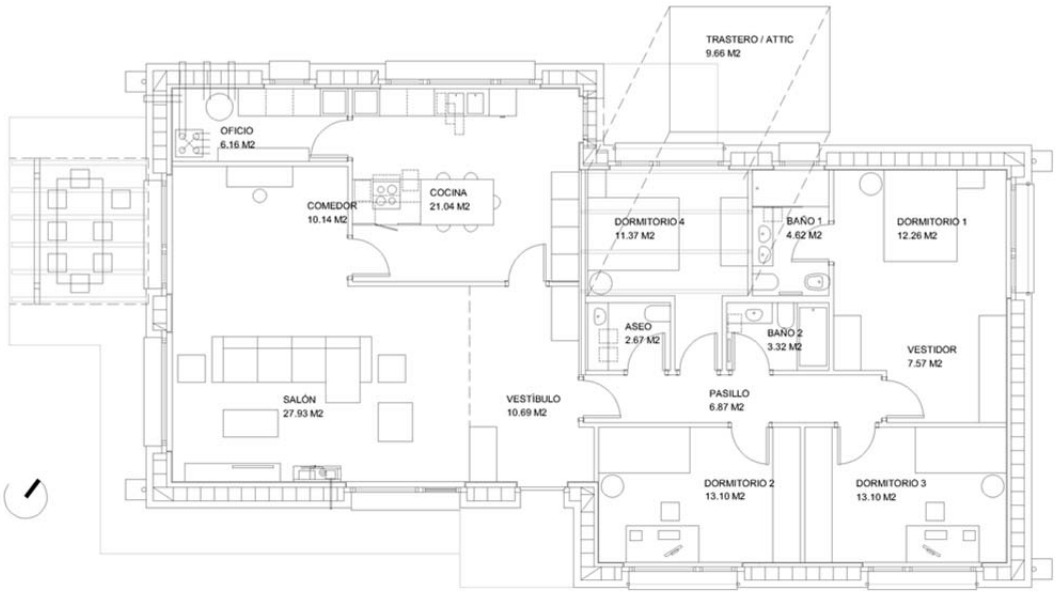
Living room from the dining room

Main bathroom

Cross section

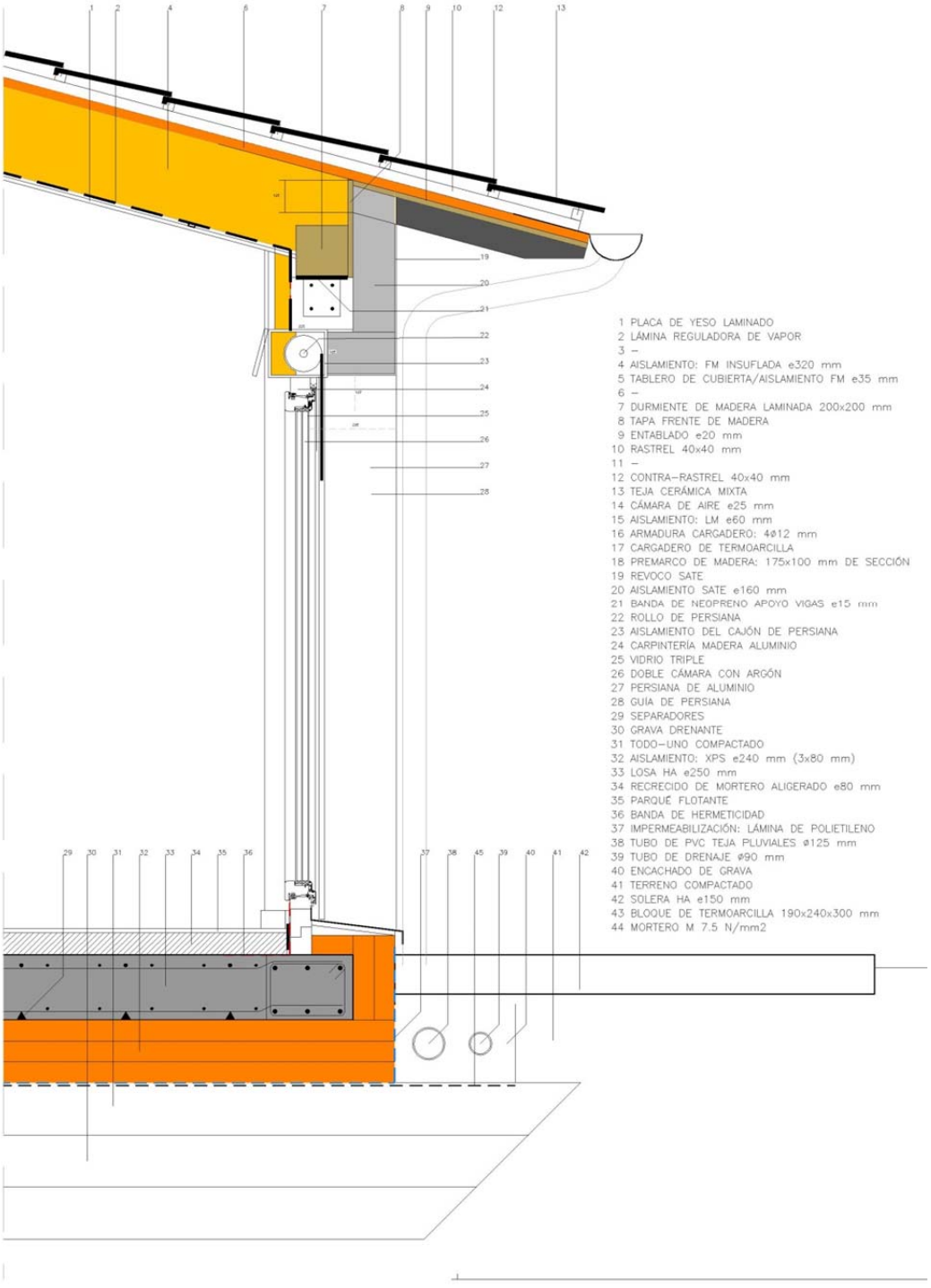


Floor plans



Overview of the plot

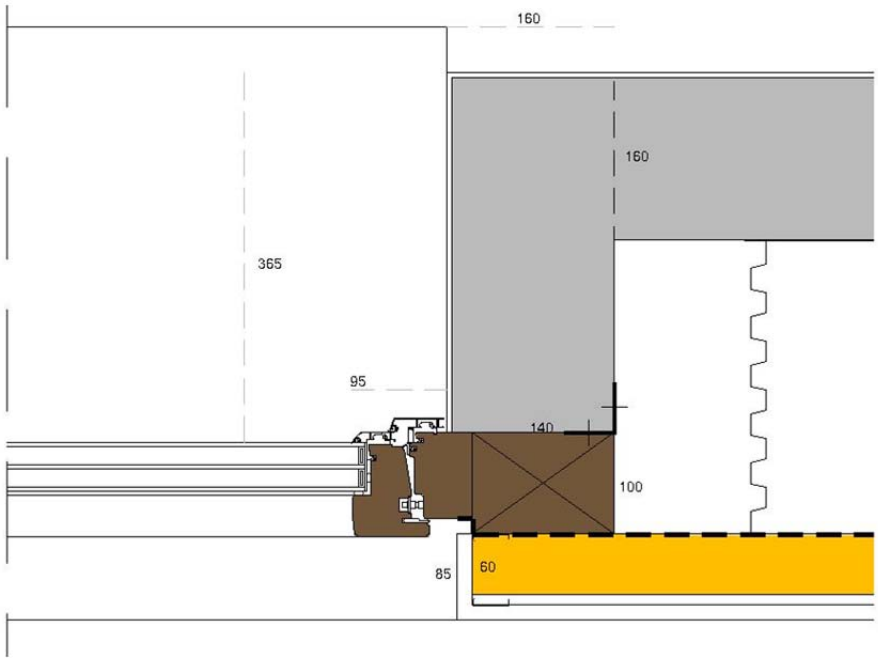
Construction PH details



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.

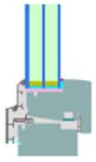


Category: **Window frame**
Manufacturer: **Carpintería Llodiana S.A., Llodio, Spain**
Product name: **VENTACLIM SUPER-CONFORT**

This certificate was awarded based on the following criteria for the warm, temperate climate zone

Comfort U_W = 1.00 ≤ 1.00 W/(m² K)
$U_{W,\,installed}$ ≤ 1.05 W/(m² K)
mit U_g = 0.90 W/(m² K)

Hygiene $f_{Rsi=0.25}$ ≥ 0.65

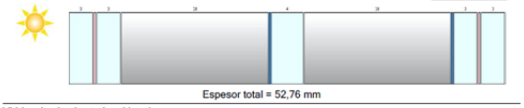


warm, temperate climate
ph B
CERTIFIED COMPONENT
Passive House Institute

Passive House efficiency class: phE | phD | phC | phB | phA
www.passivehouse.com

U_f = 0.98 W/m2K

Codigo de producto: 70 / 50 / 0,5



Espesor total = 52,76 mm

Vidrios desde el exterior al interior:

Hoja 1		Hoja 2		Hoja 3	
3 mm	Float Glass ExtraClear	4 mm	ClimaGuard Premium Float Glass ExtraClear	3 mm	ClimaGuard Premium Float Glass ExtraClear
0,38 mm	PVB Clear			0,38 mm	PVB Clear
3 mm	Float Glass ExtraClear			3 mm	Float Glass ExtraClear

Cámara 1 - 18 mm		Cámara 2 - 18 mm	
10%	Aire	10%	Aire
90%	Argón	90%	Argón

Resultados

Luz visible (EN 410 - 2011)		Energía Solar (EN 410 - 2011)	
Transmitancia Luminosa [%]	τ_v = 69,6	Transmitancia energética solar total [%]	g = 49,7
Reflexión Luminosa exterior [%]	ρ_v = 14,8	Coeficiente de sombra (G/0,87)	sc = 0,57
Reflexión Luminosa interior [%]	ρ_v = 15,1	Transmitancia energética directa [%]	τ_e = 38,8
Indice general de rendimiento de color	R_a = 94,9	Reflexión energética exterior [%]	ρ_e = 28,3
		Reflexión energética interior [%]	ρ_e = 27,5
Propiedades térmicas (EN 673 - 2011)		Absorción energética [%]	a = 32,9
Valor-U [W/(m²K)] Inclinación α = 90°		Transitancia de UV [%]	τ_{uv} = 0,4
Conforme EN:	U_g = 0,5	Transmitancia energética indirecta [%]	q_i = 10,9
Con tres decimales:	U_g = 0,524	**Otros datos**	
		Indice de atenuación acústica estimada [dB] (EN 717-1)	R_w = NPD C = NPD C_{tr} = NPD

U_g = 0.52 W/m2K g= 0.50

Airtight envelope: documentation of the pressure test

Airtightness in detail

Blower door test

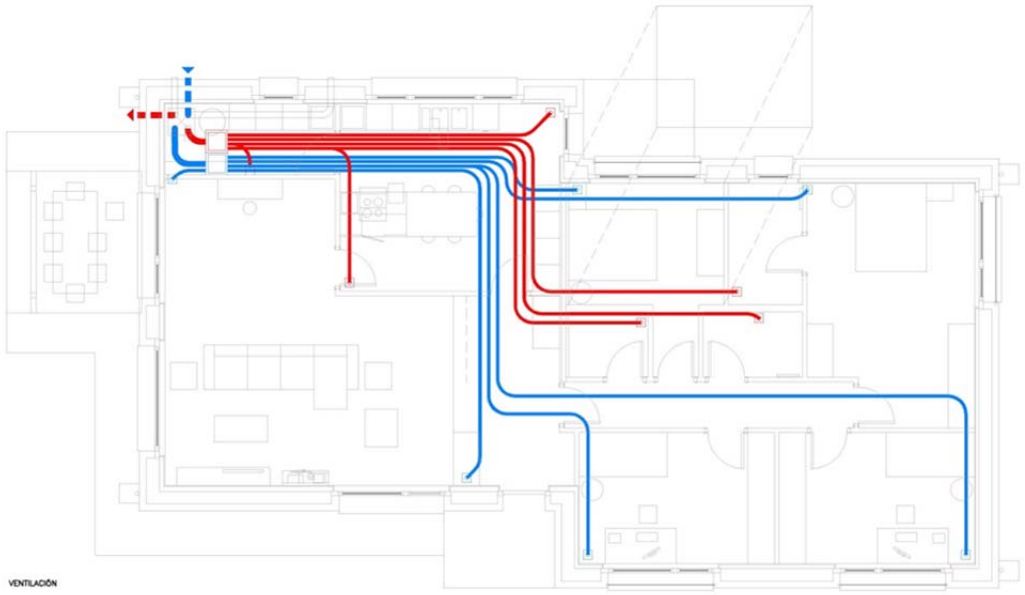
AIRTIGHTNESS

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.

	Depressurization	Pressurization	Average
Test Results at 50 Pascals:			
V50: m³/h Airflow	309 (+/- 1.1 %)	248 (+/- 0.9 %)	278
n50: 1/h (Air Change Rate)	0.68	0.54	0.61
w50: m³/(h·m² Floor Area)	1.93	1.54	1.74
q50: m³/(h·m² Envelope Area)	0.58	0.46	0.52
Leakage Areas:			
Canadian EqLA @ 10 Pa (cm²)	111.5 (+/- 4.5 %)	96.3 (+/- 3.5 %)	103.9
cm²/m² Surface Area	0.21	0.18	0.19
LBL ELA @ 4 Pa (cm²)	56.7 (+/- 7.0 %)	51.0 (+/- 5.4 %)	53.9
cm²/m² Surface Area	0.11	0.10	0.10
Building Leakage Curve:			
Air Flow Coefficient (Cenv) m³/(h·Paⁿ)	20.3 (+/- 10.9 %)	19.5 (+/- 8.5 %)	
Air Leakage Coefficient (CL) m³/(h·Paⁿ)	19.9 (+/- 10.9 %)	19.1 (+/- 8.5 %)	
Exponent (n)	0.701 (+/- 0.028)	0.655 (+/- 0.022)	
Correlation Coefficient	0.99878	0.99916	
Test Standard:	EN 13829		
Test Mode:	Depressurization and Pressurization		
Type of Test Method:	B		
Regulation complied with:	PASSIVHAUS n50 ≤ 0.6 1/h		

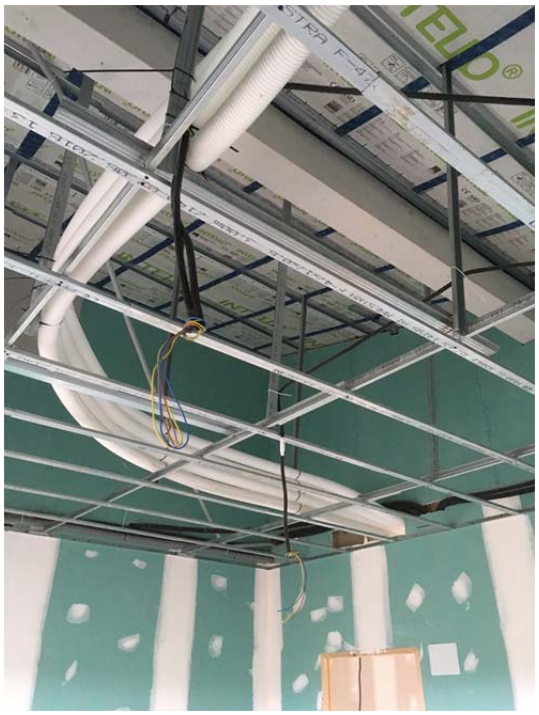
Ventilation plan for the ductwork and central unit specific values



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 recovery and the heat pump



ventilation ducts over the ceiling

Heat supply

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

Datos técnicos		min/max
largo	cm	104
profundidad	cm	33,5
altura	cm	110
potencia útil	kW	2,2/6
rendimiento	%	85,7
consumo de combustible (pellet)	kg/h	0,5/1,5
capacidad depósito pellet	kg	18
autonomía	h	10/30
Ø salida humos	cm	8
Ø toma de aire	cm	4
peso	kg	254
vol. calentable	m^3	155

There are also 450W electric towel rails in bathrooms and 400W radiant panels in the bedrooms.

Report of PHPP results

Casa Pasiva Comprobación

Edificio:	casa LYNAM				
Calle:	Artzua 4, Lasarte				
CP / Ciudad:	ES 01194	Vitoria-Gasteiz			
Provincia/País:	Álava	España			
Tipo de edificio:	vivienda unifamiliar aislada				
Datos climáticos:	ES0029b-Vitoria-Gasteiz				
Zona climática:	4: Cálido-templado	Altitud de la localización:	564 m		
Propietario / cliente:	L Usatorre / N Rz de Alegría				
Calle:					
CP / Ciudad:					
Provincia/País:					
Arquitectura:	J Crespo / A Otz de Landaluce / N Otz de Landaluce		Instalaciones:	J Crespo ARKE arquitectos	
Calle:	José Erbina 7 bajo		Calle:	José Erbina 7 bajo	
CP / Ciudad:	1005	Vitoria	CP / Ciudad:	1005	Vitoria
Provincia/País:	Álava	ES-España	Provincia/País:	Álava	ES-España
Consultoría:			Certificación:	Energiehaus Arquitectos SL	
Calle:			Calle:	Carrer Ramón Turró 100-104, 3-3	
CP / Ciudad:			CP / Ciudad:	08005	
Provincia/País:			Provincia/País:	Barcelona	ES-España

Año construcción:	2016	Temp. interior invierno [°C]:	20,0	Temp. interior verano [°C]:	25,0
Nr. de viviendas	1	Ganancias internas de calor (GIC); caso calefacción [W/m²]:	2,4	GIC caso refrigeración [W/m²]:	2,6
Nr. de personas:	3,0	Capacidad específica [Wh/K por m² de SRE]:	60	Refrigeración mecánica:	

Valores específicos referenciados a la superficie de referencia energética

					Criterio	Criterios alternativos	¿Cumplido?[2]
	Superficie de referencia energética	m²	161,4				
Calefacción	Demanda de calefacción	kWh/(m²a)	15,35	≤	15	-	Sí
	Carga de calefacción	W/m²	11,16	≤	-	10	
Refrigeración	Demanda refrigera. & deshum.	kWh/(m²a)	-	≤	-	-	-
	Carga de refrigeración	W/m²	-	≤	-	-	
	Frecuencia de sobrecalentamiento (> 25 °C)	%	0	≤	10		Sí
	Frecuencia excesivamente alta humedad (> 12 g/kg)	%	0	≤	20		Sí
Hermeticidad	Resultado ensayo presión n_{50}	1/h	0,6	≤	0,6		Sí
Energía Primaria no renovable (EP)	Demanda EP	kWh/(m²a)	84	≤	120		Sí
Energía Primaria Renovable (PER)	Demanda PER	kWh/(m²a)	54	≤	-	-	-
	Generación de Energía Renovable	kWh/(m²a)		≥	-	-	

[2] Celda vacía: Falta dato; '-': No requerimiento

Confirmo que los valores aquí presentados han sido determinados siguiendo la metodología de PHPP y están basados en los valores característicos del edificio. Los cálculos de PHPP están adjuntos a esta comprobación.

¿Casa Pasiva Classic? Sí

Función:	Nombre:	Apellido:	Firma:
	Fecha emisión:	Ciudad:	

construction costs

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

Costs for the building

-

Year of construction

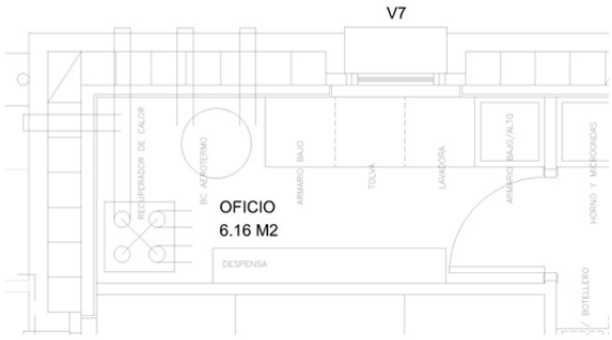
February ... October 2016

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

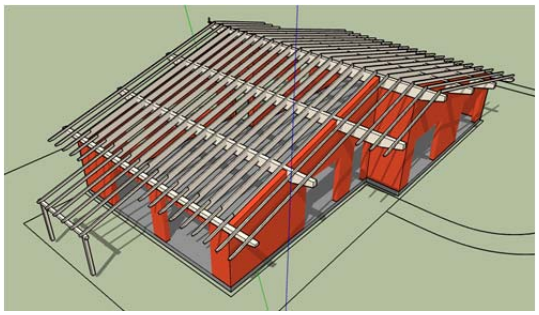
The main insulation of the fachade is EPS Neopor, with a low diffusion of the steam

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 ocuppied 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.