Casa Chatfield
Project Documentation
ID:6760 / Building year: 2020

Promoter and constructor: HG Construcciones y Servicios SL, Hilmar Gersie
Architects: RV-Arquitectos Architectural Studio
Passive House designer: Katrin Falck-Szenessy / ak-arquitectos

Casa Chatfield is located in the Urb. Colinas del Mar in San Roque, province of Cadiz.
The house consists of a ground floor with living room, dining room, kitchen and a visitor's bedroom, an upper floor with two bedrooms and a large basement with possibilities for a workshop or studio. The thermal envelope consists of the entire three floors.

Component data:

U-value of the outer façade: 0.377 W/(m2K)Valor
U-value of basement floor: 0,310 W/(m2K)
U-value of the roof: 0.196 W/(m2K)
U-value of windows: 1.2 W/(m2K)
Heat recovery: 80.6

PHPP annual heat requirement: 2.63 kWh/m2a
PHPP annual cooling requirement: 9,02 kWh/m2a
PHPP PER requirement: 47.69 kWh/(m2a)
Pressure-air change test n50: 0.4 1/h

Energy Reference Surface S.R.E.:	371 m²
Heating demand:	3 kWh/m²a
Heating load:	9 W/m²
Cooling demand:	9 kWh/m²a
Cooling load:	12 W/m²
Airtightness test:	0.4 h^{-1}
Primary energy demand EP:	45 kWh/m²a
Renewable Primary Energy Demand PER:	24 kWh/m²a

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1) General description of the site, location and climate

Location:

San Roque is a town in the province of Cadíz in the autonomous region of Andalusia.
The town of San Roque has 30,427 registered inhabitants (as of 1 January 2018) and an area of 140 km².

Torreguardiaro is an urbanisation which is located in the east of the town of San Roque not far from the Mediterranean Sea on the south coast of the Iberian Peninsula. The passive house of Hilmar Gersie is located at an altitude of 77 m above sea level.

San Roque's summers are short, hot, humid, arid and mostly clear and the winters are long, cool, wet, windy and partly cloudy. During the course of the year, the temperature generally varies from 10 °C to 28 °C and rarely drops below 7 °C or rises above 32 °C.

In order to establish a projection with the PHPP programme, climate data were taken from the climate database of Málaga of the Passivhaus Institut and corrected by the altitude factor.

Description of the house

The house consists of a ground floor with living room, dining room, kitchen and a visitor's bedroom, an upper floor with two bedrooms and a large basement with possibilities for a workshop or a studio.

The thermal envelope consists of the entire three floors.

The ceilings and floors are made of massive reinforced concrete slabs and the columns of reinforced concrete. The openings are filled with aerated concrete bricks (Ytong).

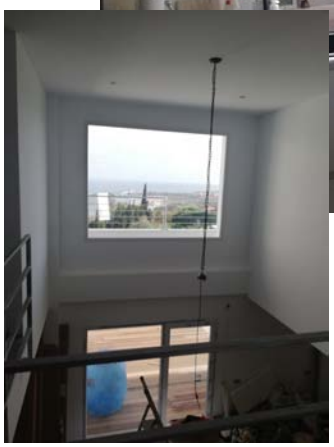
Special features:
Flat roof for active use of thermal and photovoltaic solar energy.
The windows are fitted with external roller shutters and most of the windows are protected from the sun by overhangs.
Night cooling in summer by means of thermal airstream through windows and skylights in the tower
Air-conditioning by fan-coil and air/water pump, comfortable in winter and summer

<u>Shade situation:</u>

a. The house is located on a fairly flat plot in a suburban area. The plot is large and there is not much shade from plants or trees at the moment or from houses in the neighbourhood.
b. All windows are fitted with external, insulated roller shutters which can be lowered when the sun is too strong.
c. There are small overhangs to shade the south windows in summer.

Almost shadowless views...

The finished interior:



2) Construction and thermal insulation

The structure of the construction

The house is supported on a reinforced concrete structure and completed with Ytong bricks. The roofs are made of 25 / 30cm reinforced concrete slabs.

The concept of thermal insulation

The building is completely thermally insulated:

Façade composition

A 10cm layer of Ytong is applied to all exposed external walls in the area of the pillars and on the inside a layer of Air Bur10 Insulation to minimise thermal bridges.

0.377 W/m²K

A 10cm layer of polystyrene / XPS is applied to the facade in the basement area against the ground.

Composition of the foundation/basement

The foundation consists of 30 cm reinforced concrete and 10 cm Styrodur/XPS insulation is used underneath.

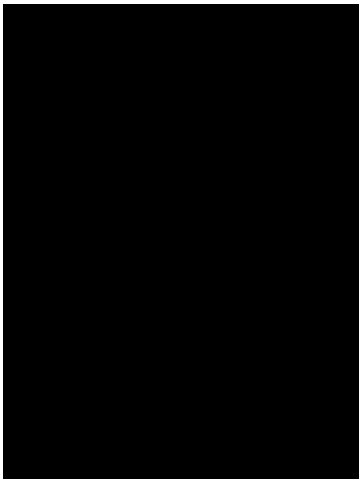
0.32 W/m²K

Composition of the roof

The roofs are made of 25 / 30cm reinforced concrete slabs. The roof is insulated with 10 cm polystyrene / XPS insulation.

0.196 W/m²K

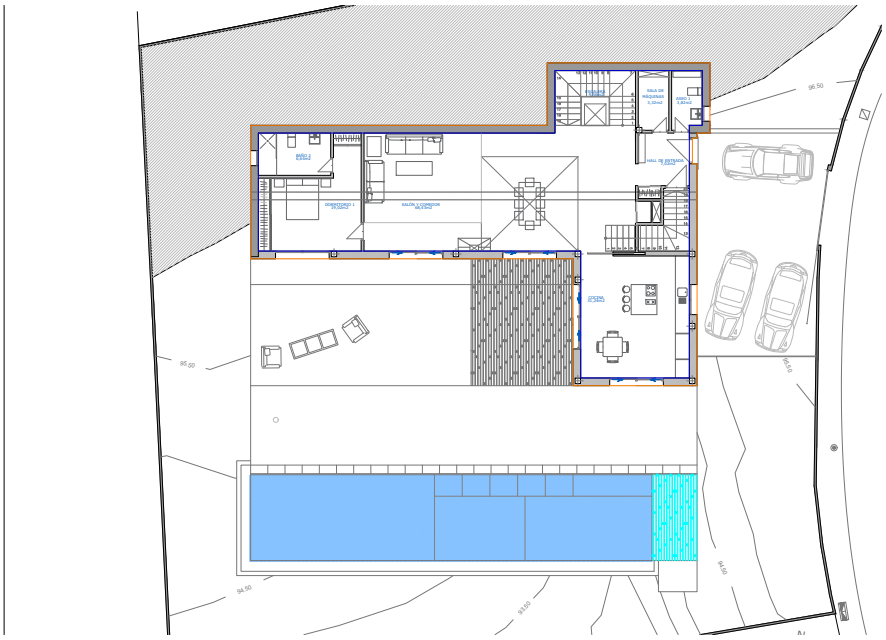
The intention was to build as far as possible without thermal bridges.



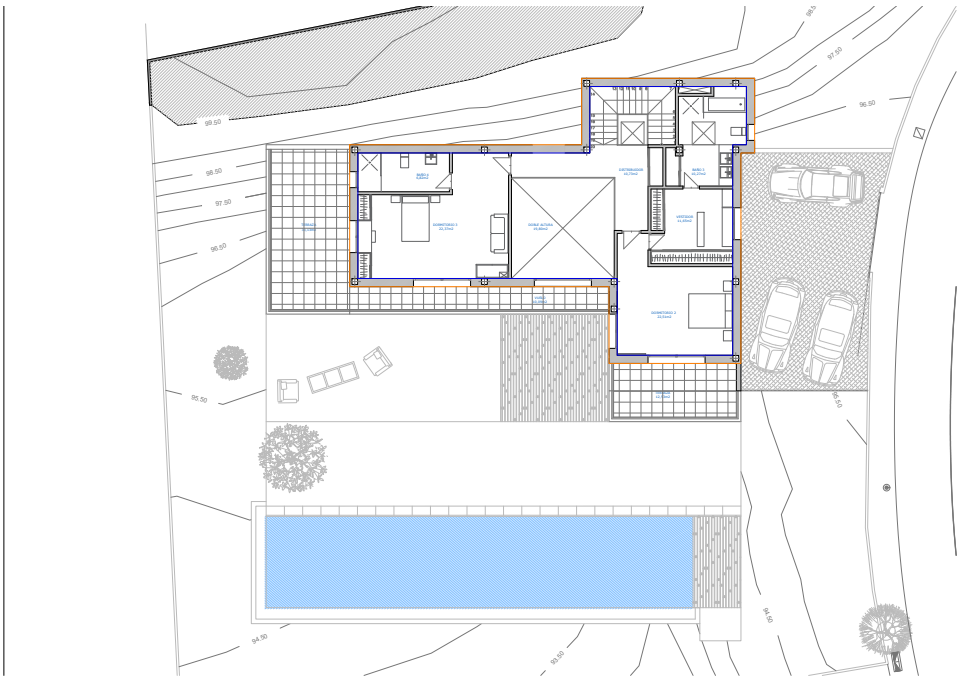
3) Plans and sections

The thermal envelope is marked in orange; the airtight area and the perforations relevant for airtightness are marked in blue.

Ground floor

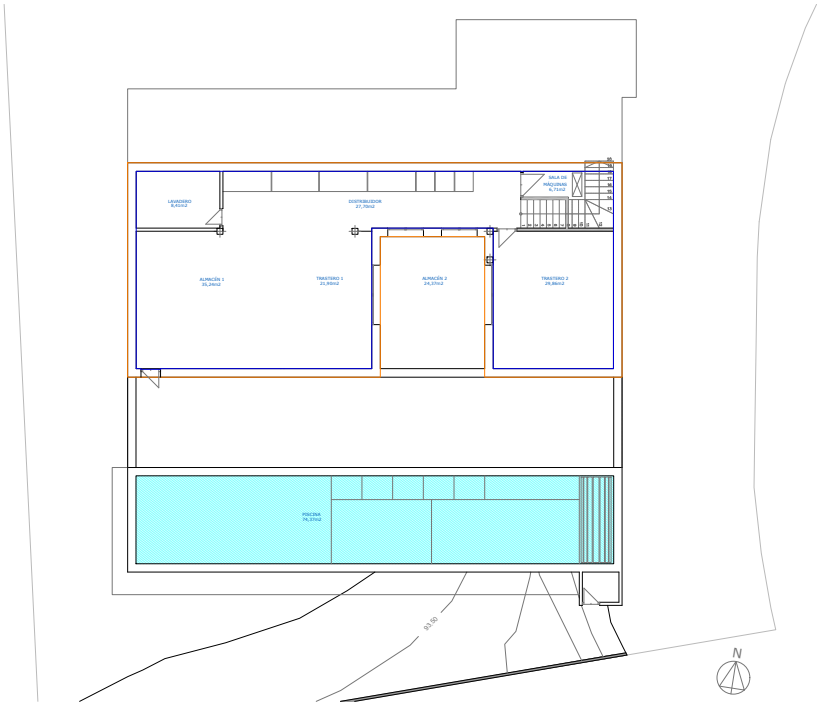


First floor

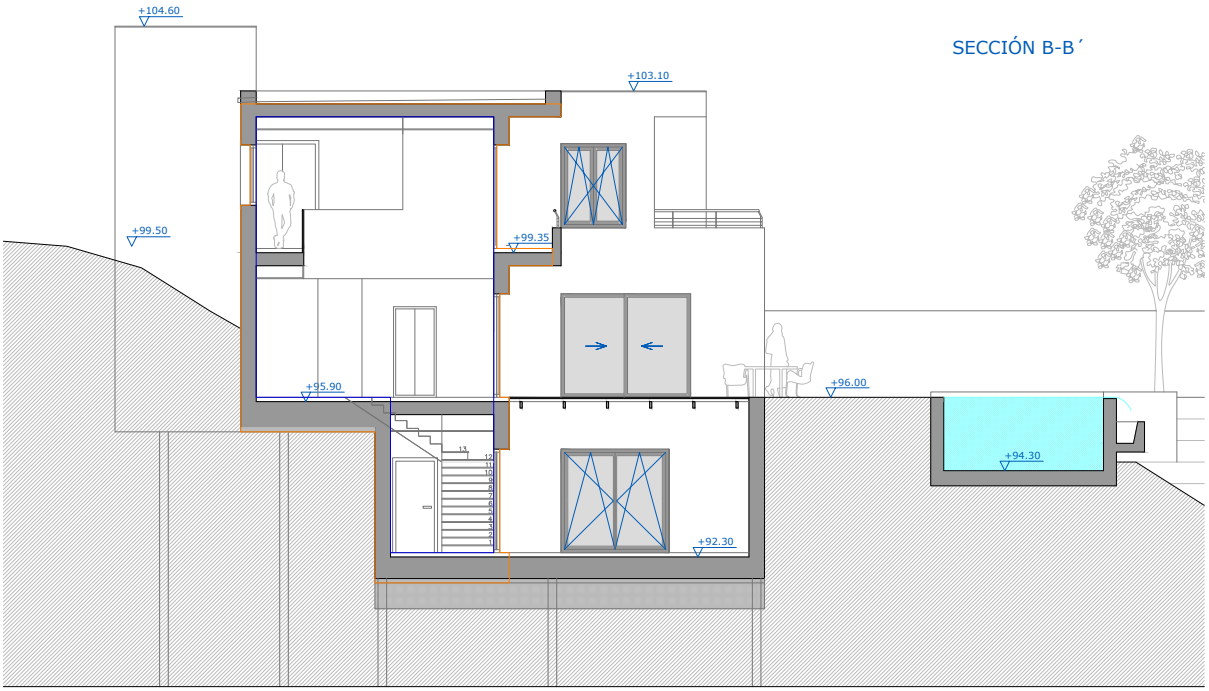


The Basement Floor

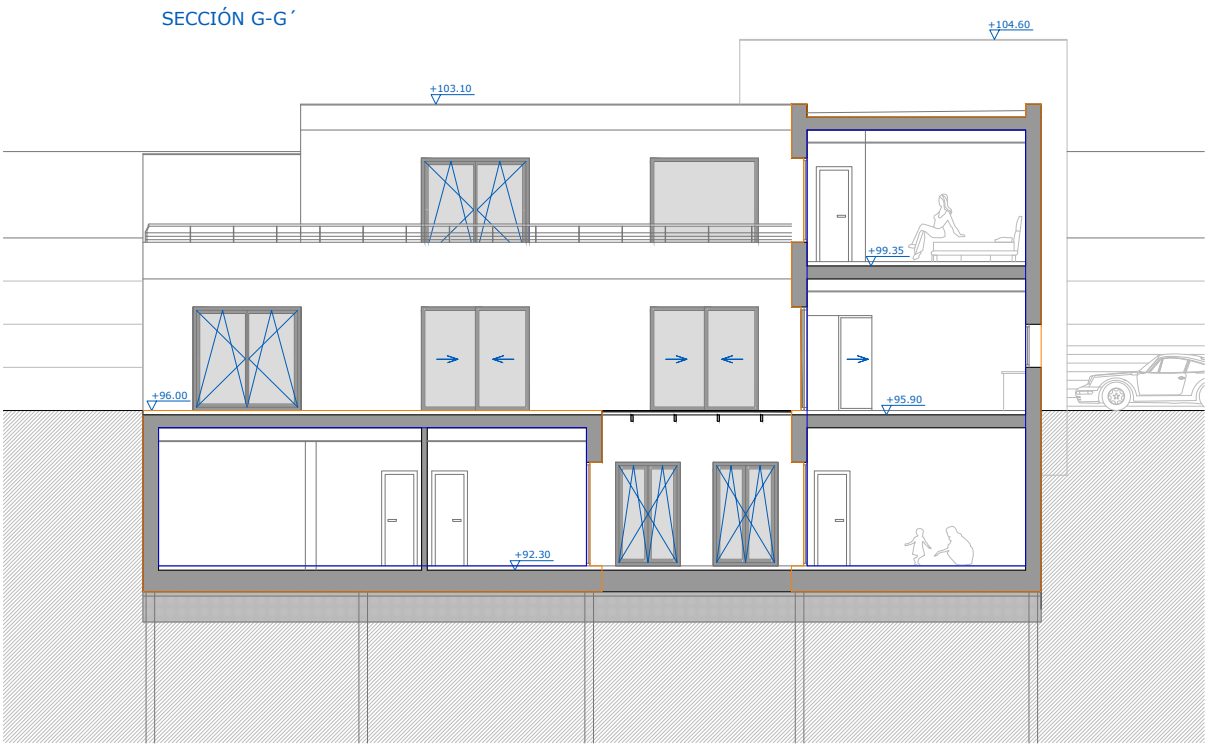
The basement floor is also located inside the thermal envelope:



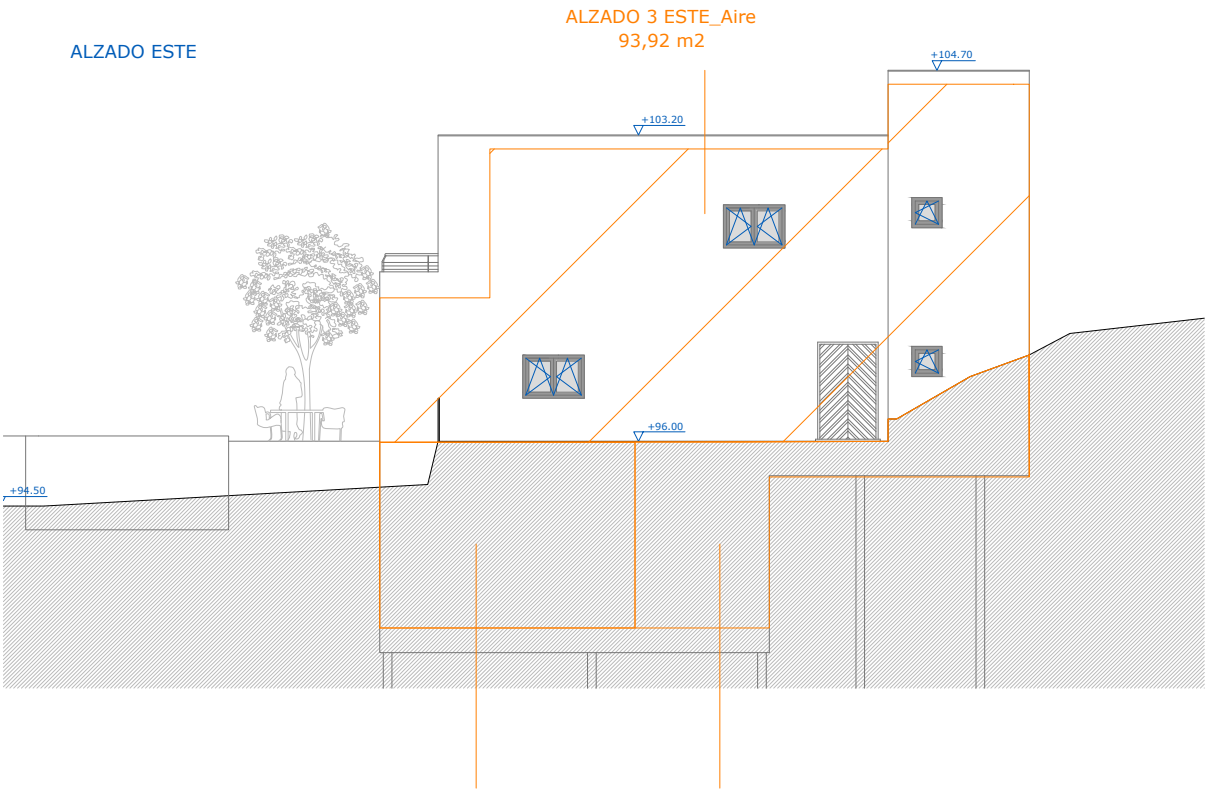
Section BB



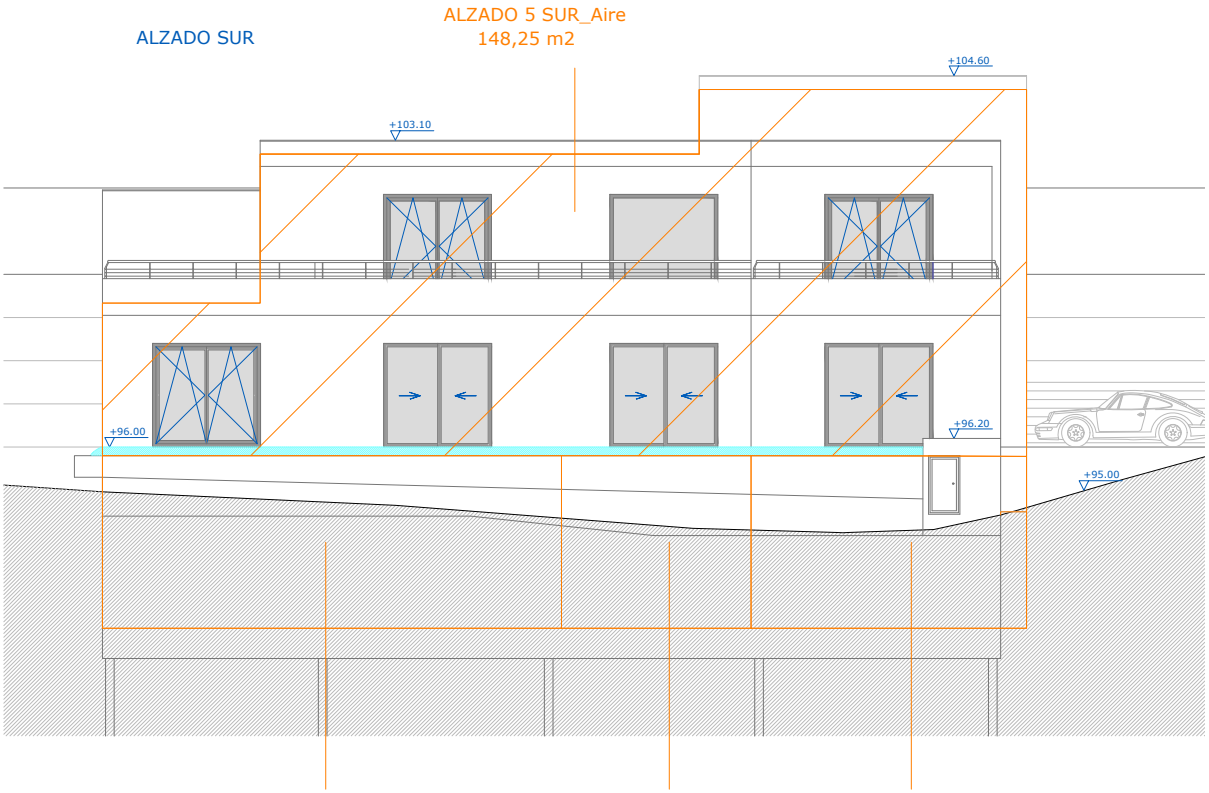
Section GG



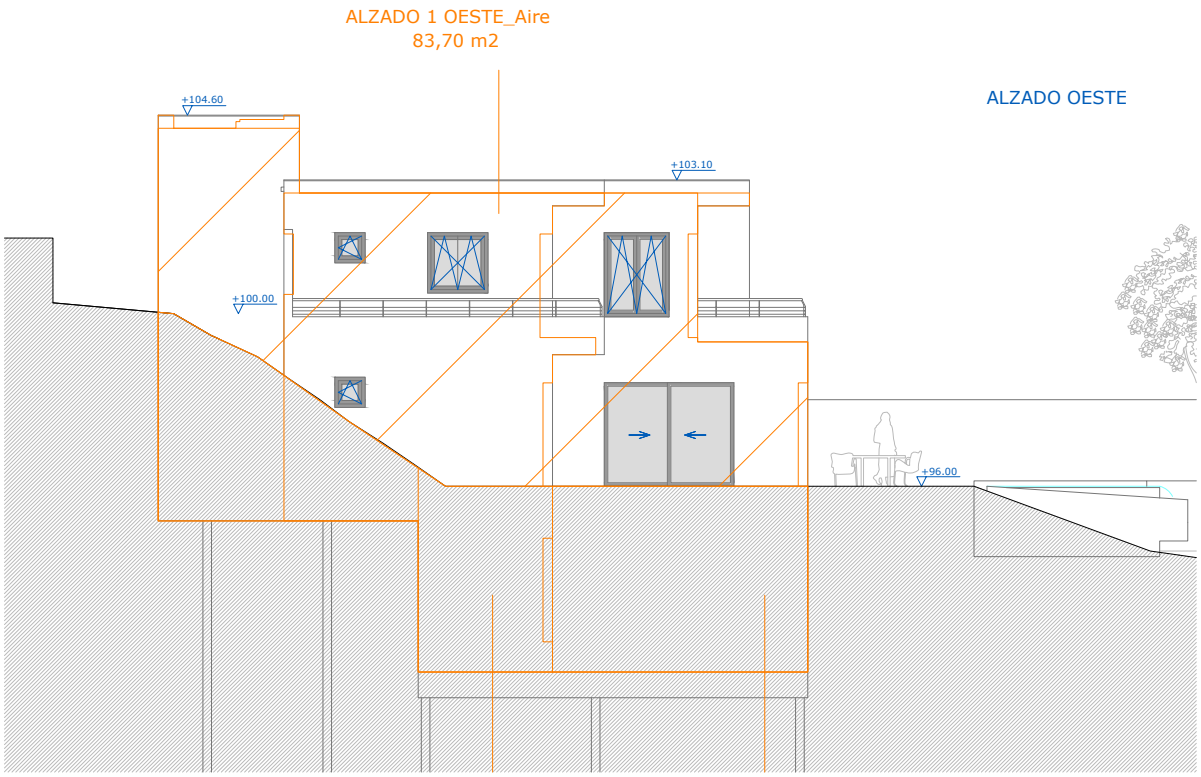
Façade East:



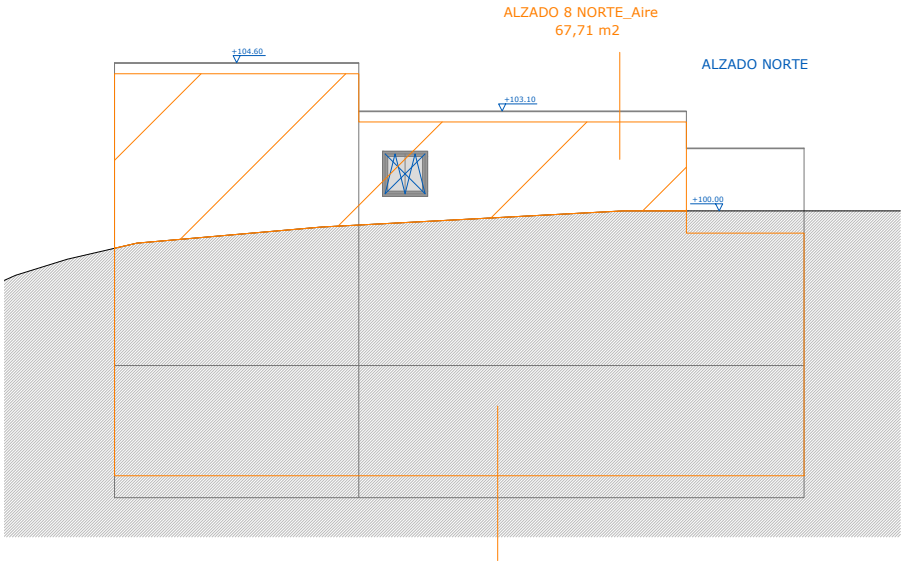
Façade South:



Façade West:



Façade North:



4) The windows

VEKA Windows have been installed: PVC windows of good quality

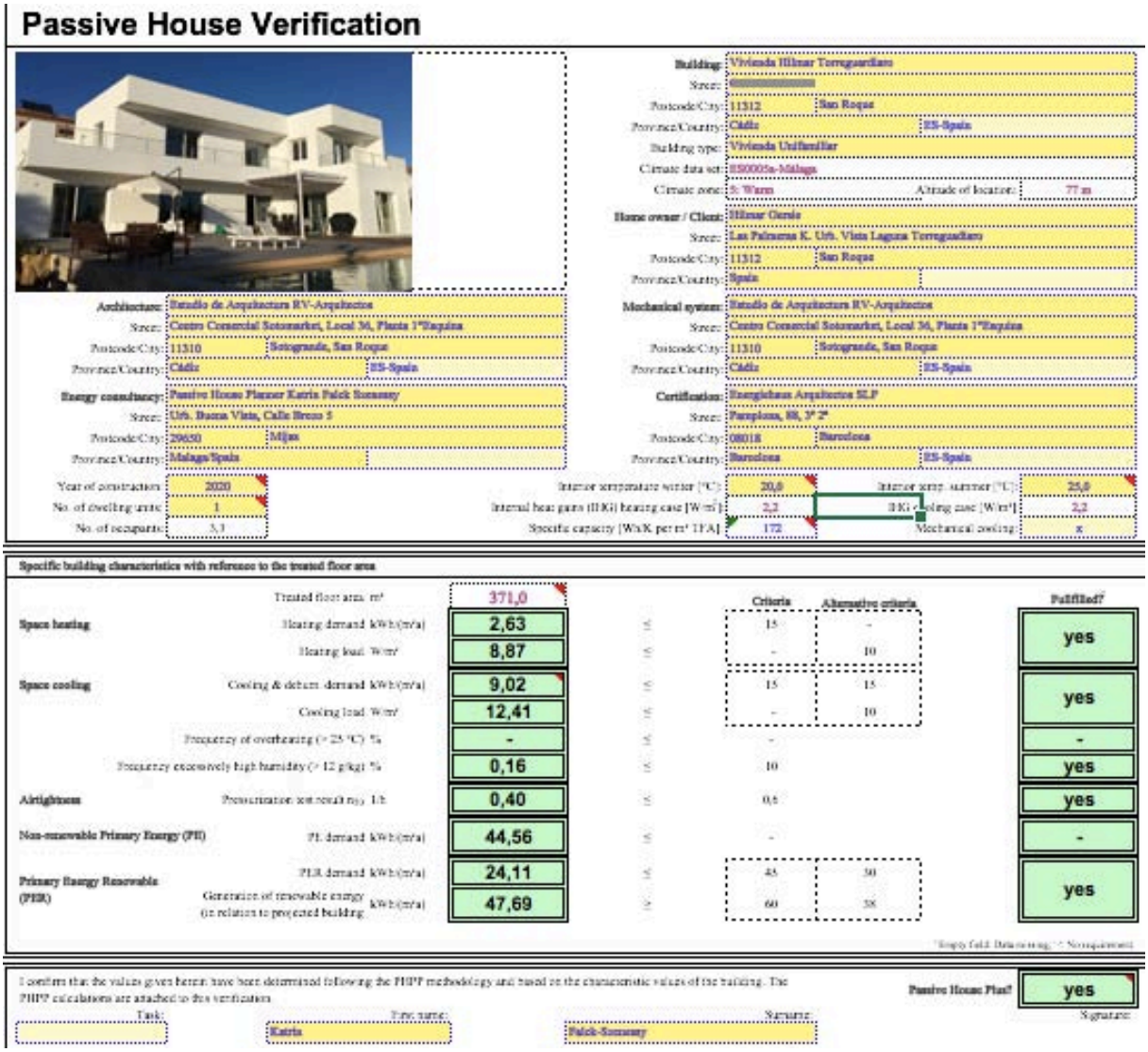
a) with double glazing

U-factor Uf = 1,3 W/(m2K)
Glass U-factor Ug= 1,1 W/(m2K)
Transparency g= 0,64

Most of the windows are fitted with adjustable external blinds. The boxes are well insulated to avoid thermal bridges.

For the summer, windows were chosen to provide additional and important night ventilation, which serves to cool the house in the hottest season.

5) The final results of the PHPP programme



Passive House Verification

Specific building characteristics with reference to the treated floor area						
	Treated floor area m²	371,0				
Space heating	Heating demand kWh/(m²a)	2,63	≤	15	-	yes
	Heating load W/m²	8,87	≤	-	10	
Space cooling	Cooling & deh.m. demand kWh/(m²a)	9,02	≤	15	15	yes
	Cooling load W/m²	12,41	≤	-	10	
	Frequency of overheating (> 25 °C) %	-	≤	-		-
	Frequency excessively high humidity (> 12 g/kg) %	0,16	≤	10		yes
Airtightness	Pressurization test result n50 1/h	0,40	≤	0,6		yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	44,56	≤	-		-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	24,11	≤	45	60	yes
	Generation of renewable energy (in relation to projected building) kWh/(m²a)	47,69	≥	60	38	

Passive House Plus? yes

Task: First name: Katrin Surname: Falck-Sonnemy Signature:

Comment based on first experiences:
In this case the builder is also the user of the house.
The quality and comfort of this house is very noticeable - in winter and in summer.
You feel very comfortable, the temperatures are pleasant and the maintenance costs are minimal.

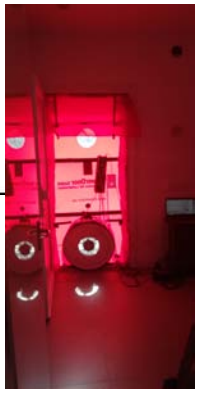
The "Passivhaus" concept is not just a theoretical concept of numbers.
It is a concept that works in reality and ensures a high quality of the building envelope and a comfortable and healthy environment for the inhabitants.

6) Airtightness concept and "Blower Door" test

In order to guarantee the airtightness of the building insulation, care was taken to ensure that the airtight level was not penetrated or was only penetrated in a few well-insulated places.
The "Blower Door" test was passed with an excellent result of 0.40 ren./hour:

Fecha del Test: 30/06/2020		Técnico:	Francisco J Soto Lara
Archivo de Test: torreguadiaro manual pcompleto 0988 2		Número de proyecto:	
Cliente:	Jürgen Hilmar Gersie C/México, 14 España/ Cádiz - 11312 Torreguadiaro (San Roque) Teléfono: Fax: e-mail: hilmar@hg-construcciones.com	Dirección del Edificio:	Vivienda unifamiliar aislada C/México, 14 España/ Cádiz - 11312 Torreguadiaro (San Roque)

	Despresurización	Presurización	Media
Resultados del test a 50 Pa:			
V50: m³/h Caudal de Aire	443 (+/- 3.2 %)	437 (+/- 3.3 %)	440
n50: 1/h (Tasa de Renovación de Aire)	0.40	0.40	0.40
w50: m³/(h·m² Área del Suelo)	1.28	1.26	1.27
q50:			
Áreas de Infiltraciones:			
EqLA @ 10 Pa (cm²)	168.4 (+/- 18.4 %)	146.9 (+/- 18.2 %)	157.6
LBL ELA @ 4 Pa (cm²)	88.1 (+/- 29.2 %)	71.7 (+/- 28.8 %)	79.9
Curva de Infiltraciones del Edificio:			
Coeficiente de Caudal de Aire (Cenv) m³/(h·Paⁿ)	32.8 (+/- 45.7 %)	23.7 (+/- 44.9 %)	
Coeficiente de Infiltraciones (CL) m³/(h·Paⁿ)	32.4 (+/- 45.7 %)	23.7 (+/- 44.9 %)	
Exponente (n)	0.669 (+/- 0.119)	0.745 (+/- 0.117)	
Coeficiente de Correlación	0.98824	0.99084	
Norma del Test:	EN 13829		
Modo del Test:	Despresurización y Presurización		
Método del Test:	A		
Norma a cumplir:	n50 ≤ 0.60 1/h		



7) Comfort in summer and winter

1) Refrigeration

a. In order to protect the house from overheating in summer, external blinds are installed on the windows to prevent light from entering the house.

b. In addition, the main southern windows are protected from the summer sun by a cantilever from the upper floor that provides shade.

c. In case of high summer temperatures, the house is cooled at night by means of manual ventilation.
We have developed a summer ventilation concept that tilts or opens several pre-defined windows during high summer temperatures. By opening windows in opposite positions as well as by the effect of the thermal aerostatic thrust through three floors at night, a large volume of warm air can be exchanged for cooler air.

d. For very hot summer days, an air/water pump is installed which distributes cool air via fan coil into the house.

2) Heating

a. The main source of heat for the whole year is solar radiation through the windows. In the south of Spain there are almost 3000 hours of sunshine per year, so that the solar energy yield is high. The windows on the ground and upper floors serve as sun collectors from early morning until late afternoon.

b. The house has a solar thermal system with 2 solar panels mounted on the flat roof. These are used to heat the domestic hot water. In winter and in periods with a lot of cloudy days there is a support by the air/water pump which is producing heat for heating the DHW.

c. The same air/water pump produces heat for distribution through the underfloor heating of the house during winter time.

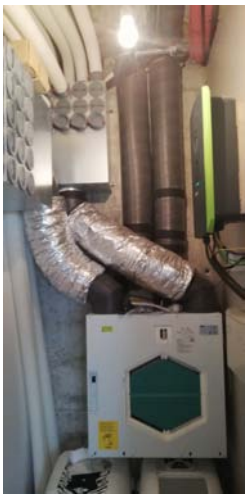
8) Centralised ventilation

The ventilation system

A Helios centralised ventilation system is installed: KWL EC 370 W R REF. 4245. The system serves to ventilate the ground floor, upper floor and basement and has a heat recovery device with cross-flow heat exchangers with an efficiency of 80.6%.

Air distribution

The ventilation pipes are installed in the false ceilings under the floor slabs on each floor. From the central distribution box there is an individual pipe to every air intake and extraction part of the house. Each bedroom and living room has its own extraction and the kitchen, bathrooms and storerooms have their own extraction. The corridors and passageways of the house are zones in between and allow the air to circulate.



9) Reduced energy consumption

Technical specifications of the low energy concept

Appliances
Appliances are carefully chosen so that only energy efficient appliances are installed.

Lighting
LEDs are used for lighting inside the house.

Photovoltaic system
The photovoltaic system has 21 photovoltaic panels of 335 W - 7,035 kWp in total - and is located on the flat roof (sold by Ja Solar).