1 Abstract

1.1 Data of building

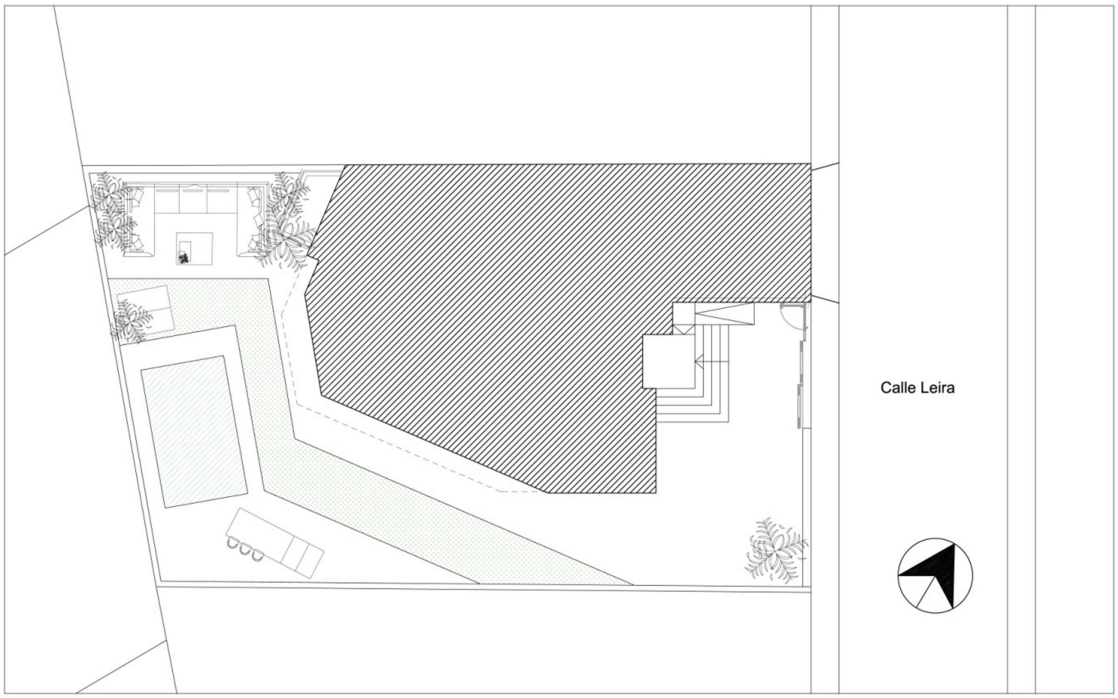
Year of construction/	2020	**Space heating**	**16 kWh/(m²a)**
Area	292.50 m²		
U-value external wall	0.155 W/(m²K)	**Space cooling**	**10 kWh/(m²a)**
U-value basement wall	0.182 W/(m²K)		
U-value basement floor	0.194 W/(m²K)	**Primary Energy Renewable (PER)**	36 kWh/(m²a)
U-value roof	0.167 W/(m²K)	**Generation of renewable energy**	16 kWh/(m²a)
U-value window	1.52 W/(m²K)	**Non-renewable Primary Energy (PE)**	57 kWh/(m²a)
Heat recovery	85.3 %	**Pressure test n50**	0.43 h-1
Special features		.	

1.2 Brief Description of the Project

A party walls single family house. It has been designed to create overhangs to protect from solar radiation in summer. Protection is increased with the use of adjustable blinds.

The building has a floor area of 292.50 m^2 distributed over four levels. The services room, music room and the games room are located in the basement. The rest of living spaces are distributed between ground floor, first and second floor. On the second floor there is a study room with bathroom and a large terrace.

(Source: Google Earth)



Situation plan

1.3 Responsible project participants

Architect/ Entwurfsverfasser	Ramón Puñet Corvillo y Luis Alfaro
Implementation planning/ Ausführungsplanung	GEAR Obras y Construcciones SL
Building systems/ Haustechnik	Instalaciones Técnicas ECAF SL
Structural engineering/ Baustatik	Juan Miñé Gómez
Building physics/ Bauphysik	Juan Miñé Gómez
Passive House project planning/ Passivhaus-Projektierung	Juan Miñé Gómez
Construction management/ Bauleitung	GEAR Obras y Construcciones SL

Certifying body/ Zertifizierungsstelle	Anne Vogt (VAND arquitectura)	
Certification ID/ Zertifizierungs ID	Project-ID (www.passivehouse-database.org) Projekt-ID (www.passivehouse-database.org)	6644

Author of project documentation / Verfasser der Gebäude-Dokumentation	Juan Miñé Gómez
Date, Signature/ Datum, Unterschrift	

Madrid, 1st of september 2021

2 Pictures of the project

2.1 Exterior photographs

East view

South-east view

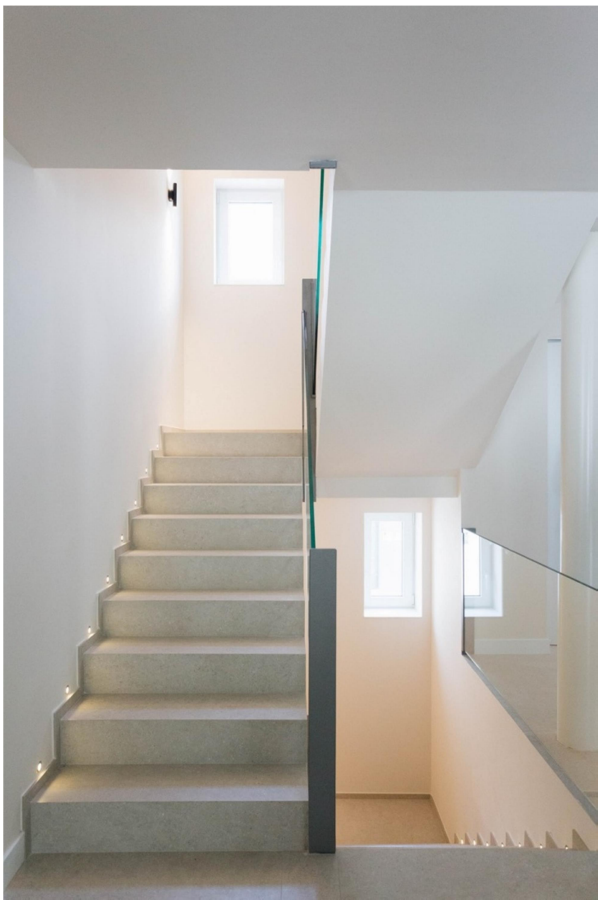
South-West view

Second floor, Terrace view

2.2 Photographs of the inside

Games room in the basement

Living room and the kitchen in the ground floor



Staircase

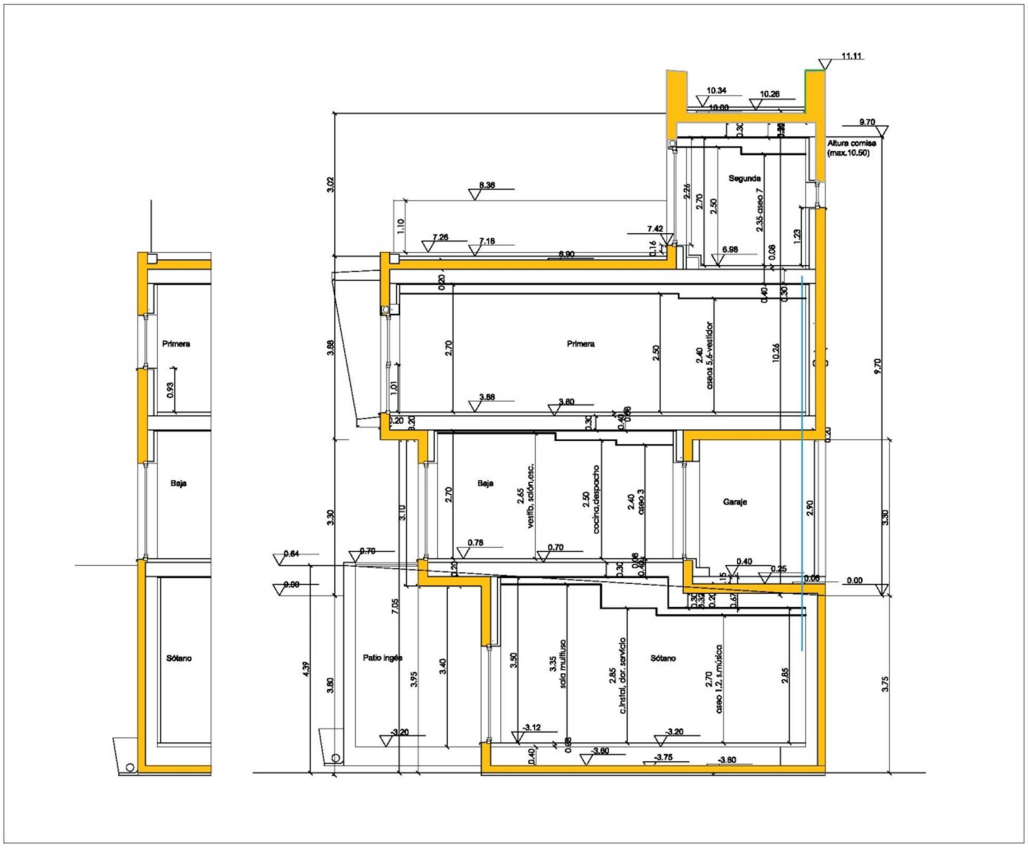
Distributor on the first floor

First floor bedroom

Staircase on second floor

Second floor and terrace acces

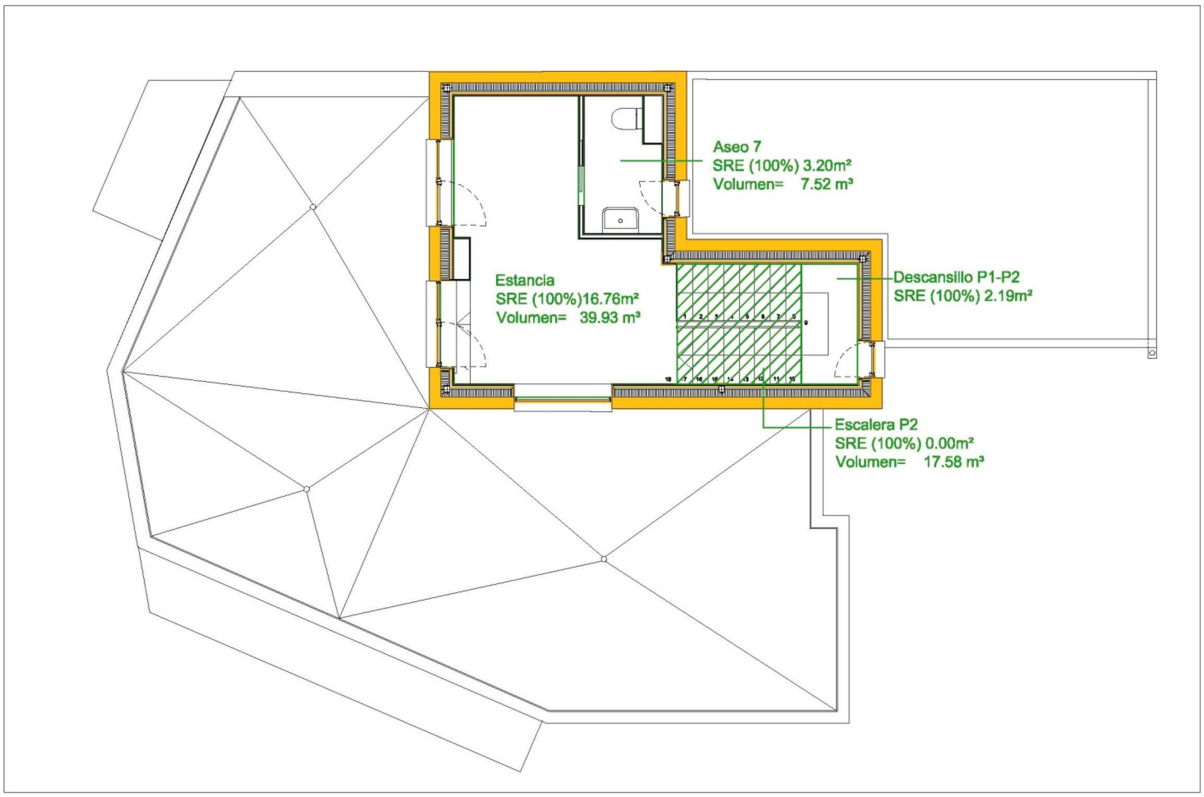
3 Sectional drawing



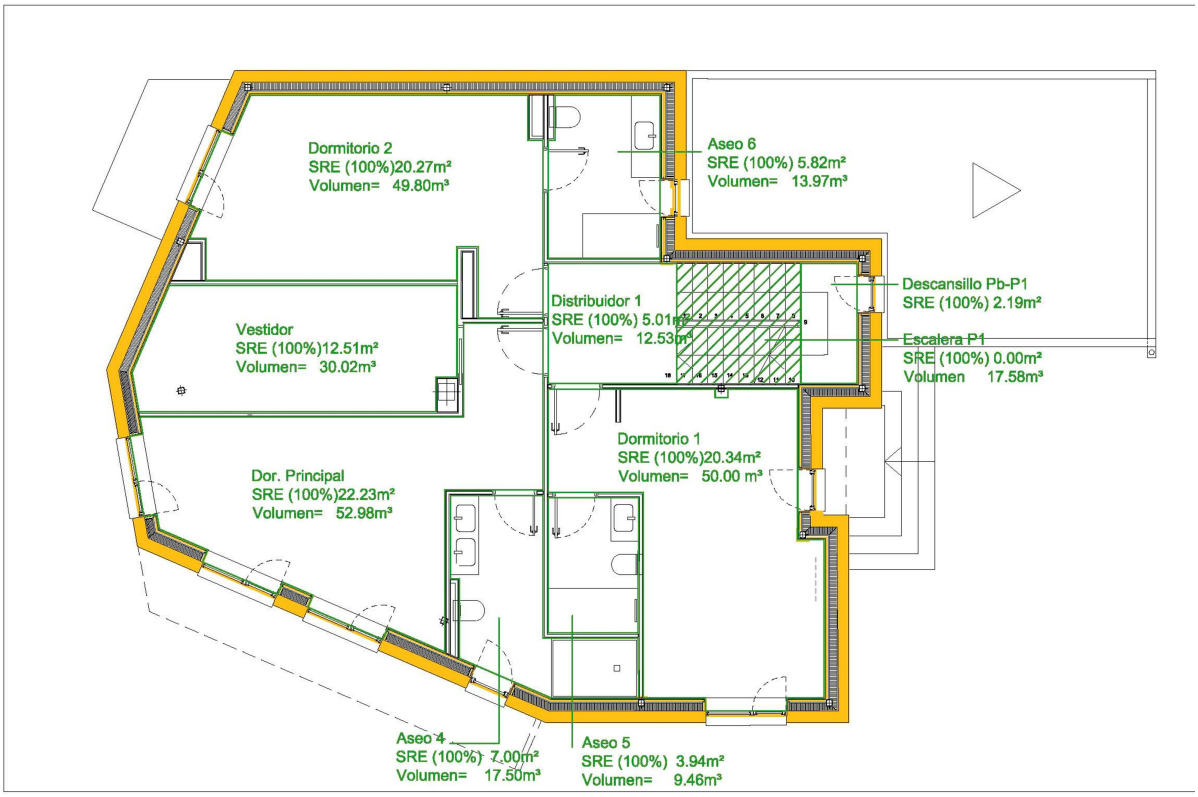
Schematic section

4 Floor plans

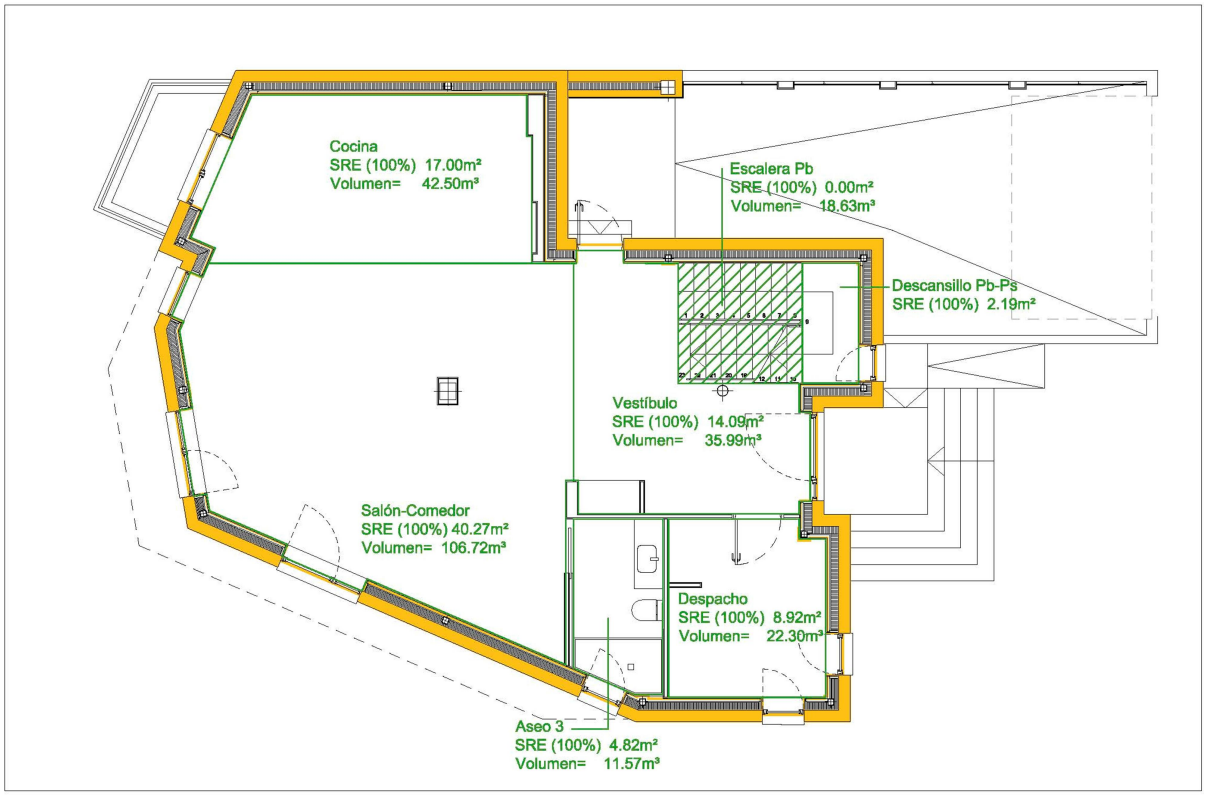
Thermal envelope (yellow line) and TFA are shown in the following plans:



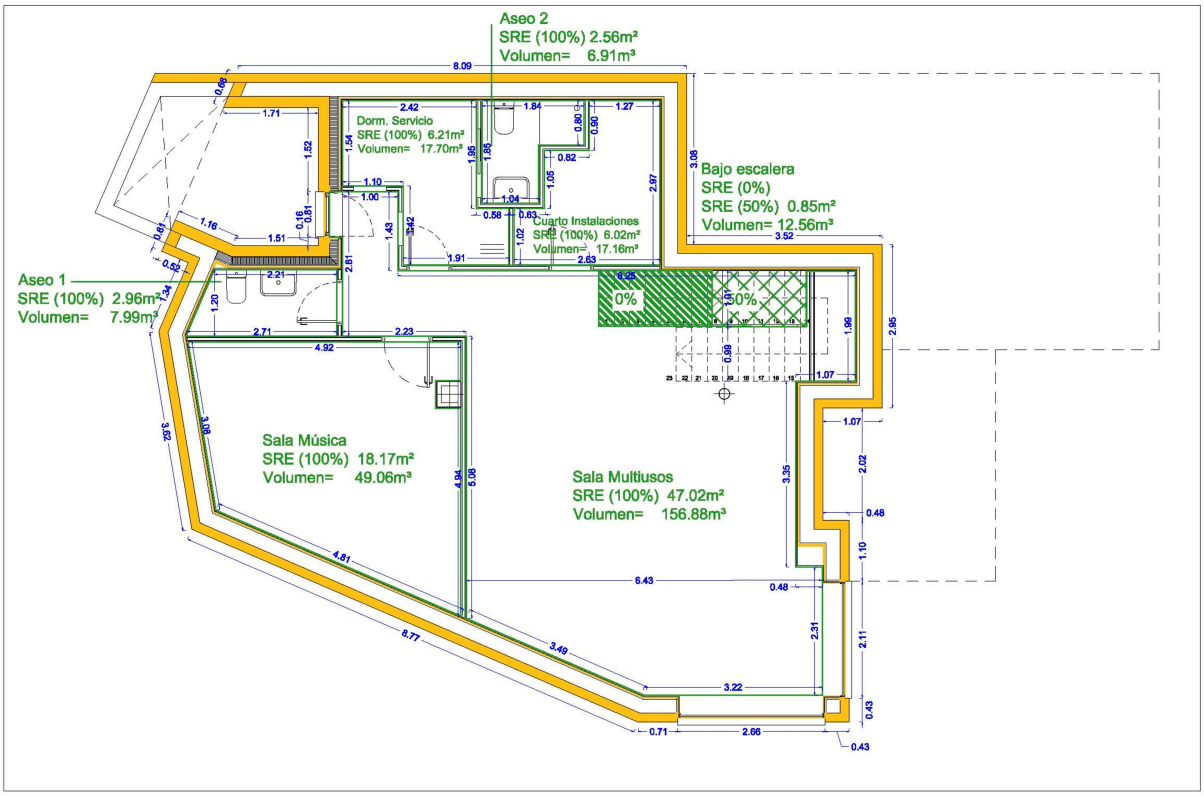
Second floor



First floor



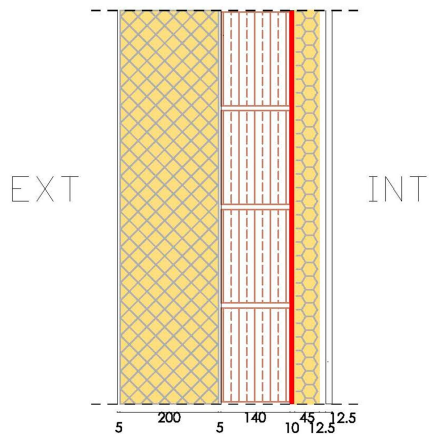
Ground floor



Basement floor

5 Technical details of the construction

5.1 Exterior walls

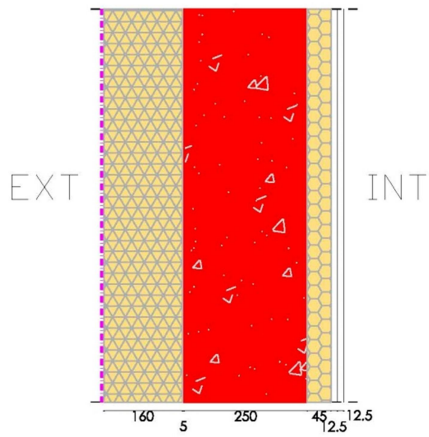


(EXT) : (OUTDOOR)	λ (WmK)	(mm)
Mineral based exterior plaster	1.400	5
Insulation EPS	0.037	200
Cement bonded adhesive	1.400	2
Honeycomb clay block	0.438	140
Gypsum plasterboard	0.800	10
Insulation Mineral Wool	0.036	45
Double laminated gypsum wallboard	0.250	25

(INT) : (INTERIOR)

U-value = 0.155 W/m²K

5.2 Basement wall



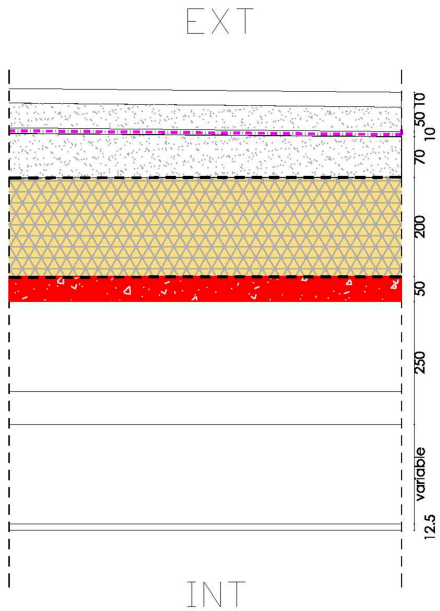
(EXT) : (OUTDOOR)	λ (WmK)	(mm)
PVC waterproofing	-	5
Insulation XPS	0.036	160
Cement bonded adhesive	1.400	5
Reinforced concrete	2.300	250
Insulation Mineral Wool	0.036	45
Double laminated gypsum wallboard	0.250	25

(INT) : (INTERIOR)

U-value = 0.182 W/m²K

Red line = airtight layer
Yellow line = thermal envelope

5.3 Flat roof

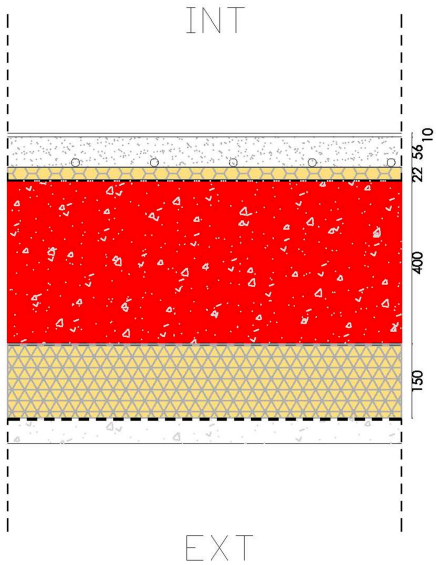


(EXT) : (OUTDOOR)	λ (WmK)	(mm)
Ceramic tile	-	10
Cement mortar	-	50
PVC waterproofing	0.230	10
Slope cement mortar	1.400	70
Geotextile	-	-
Insulation XPS	0.036	200
Geotextile	-	-
Concrete vault floor	1.429	300
Air chamber	-	-
Laminated gypsum ceiling board	-	12.5

(INT) : (INTERIOR)

U-value = 0.167 W/m²K

5.4 Basement floor



(INT) : (INTERIOR)	λ (WmK)	(mm)
Ceramic tile	2.300	10
Cement mortar	1.400	56
Isulation EPS (radian floor heat system)	0.034	22
Reinforced concrete	2.300	400
Geotextile	-	-
Insulation XPS	0.036	150
Geotextile	-	-
Concrete	-	100

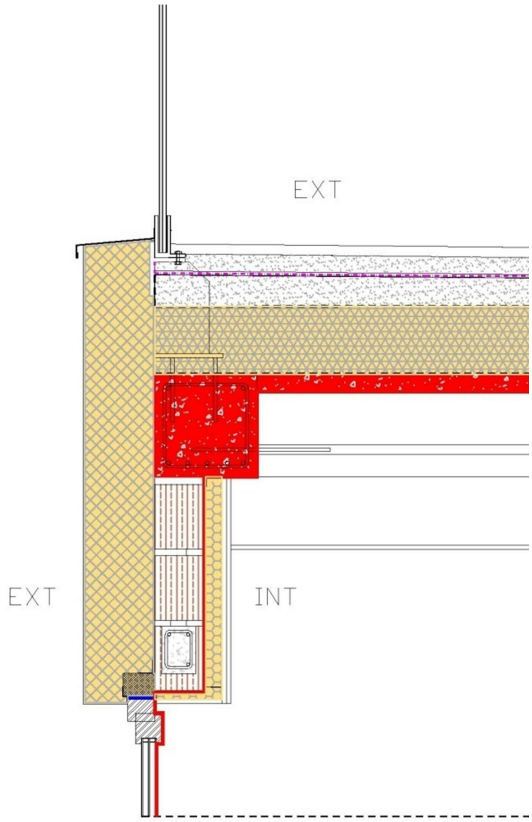
(EXT) : (OUTDOOR)

U-value = 0.194 W/m²K

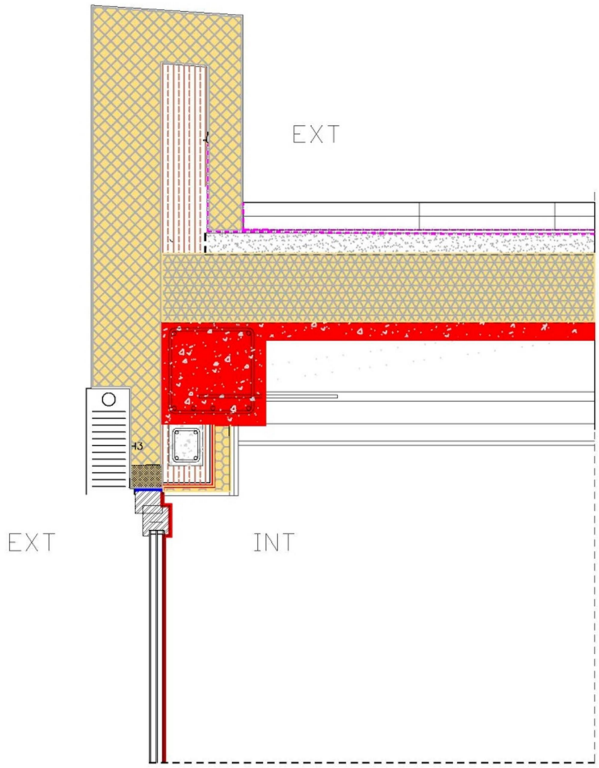
Red line = airtight layer
Yellow line = thermal envelope

5.5 Connection details

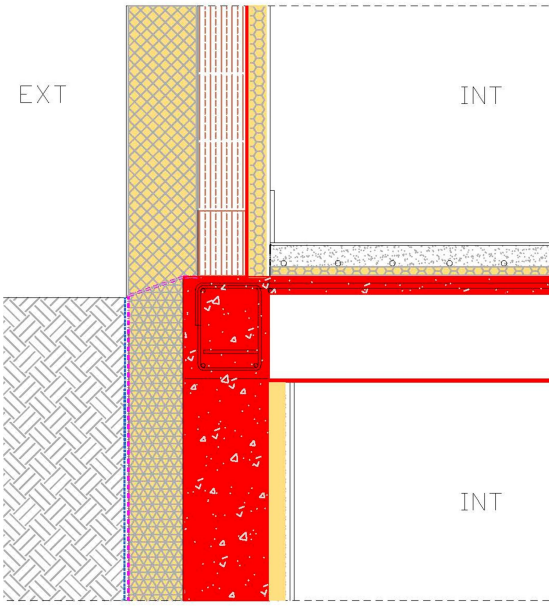
5.5.1 External wall-Flat roof (type 1)



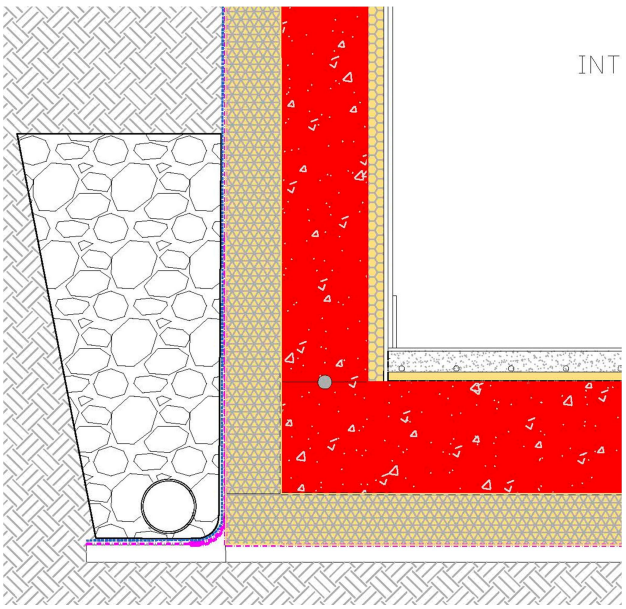
5.5.2 External wall-Flat roof (type 2)



5.5.3 External wall-Basament wall

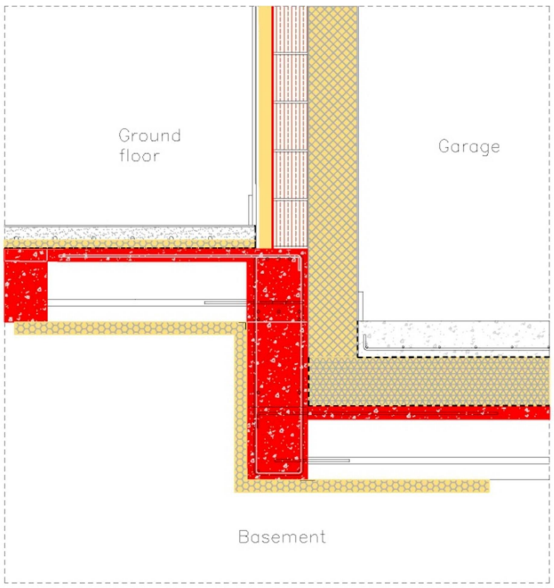


5.5.4 Basement Wall- floor slab

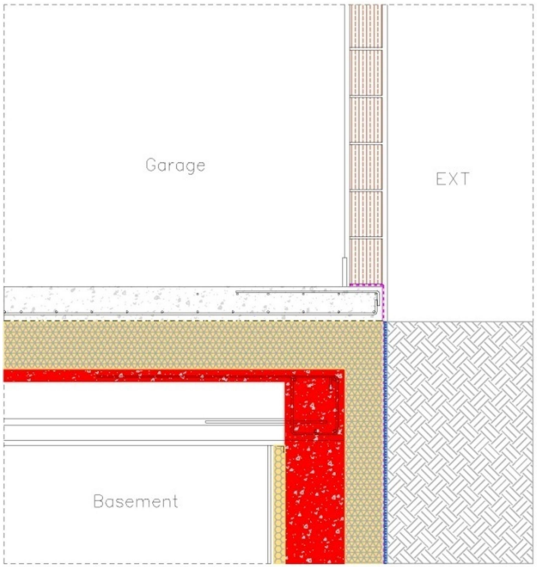


Red line = airtight layer
Yellow line = thermal envelope

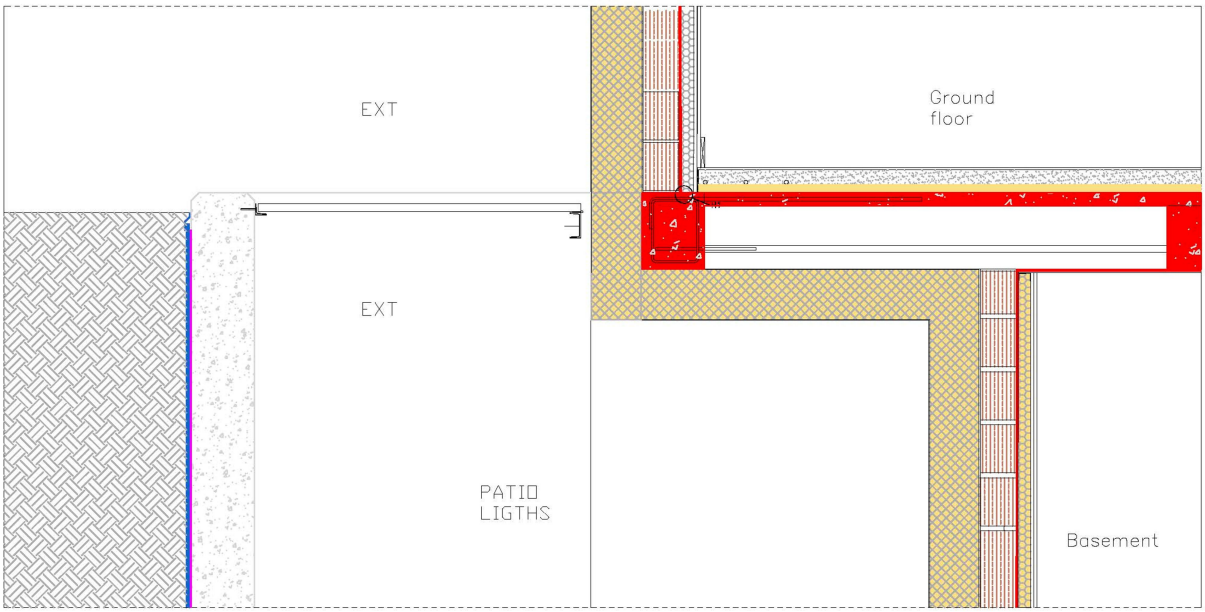
5.5.5 Ground floor-Basement-Garage



5.5.6 Basement-Garage



5.5.7 Basement-Patio lights

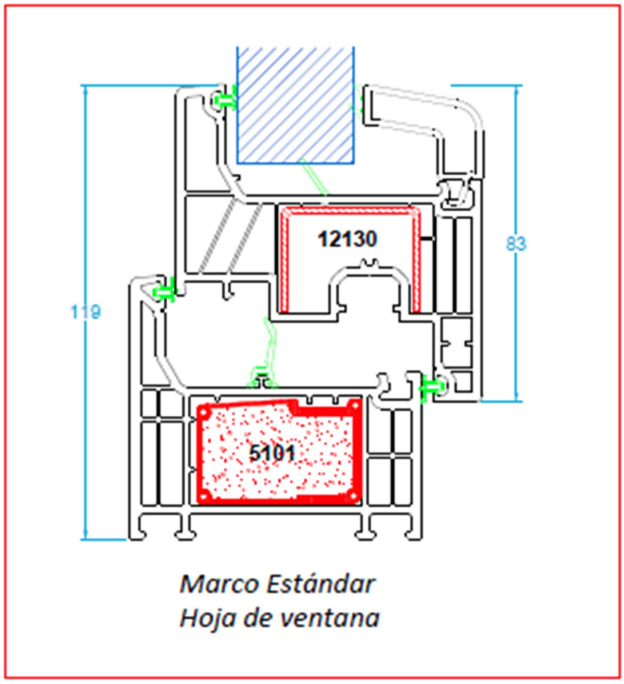


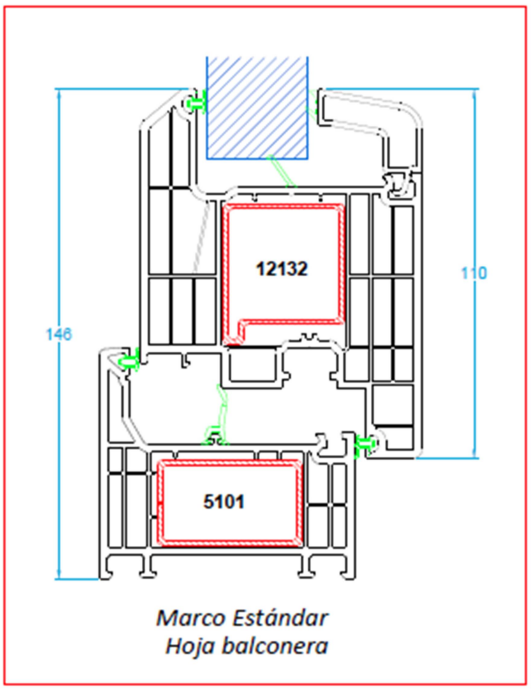
Red line = airtight layer
Yellow line = thermal envelope

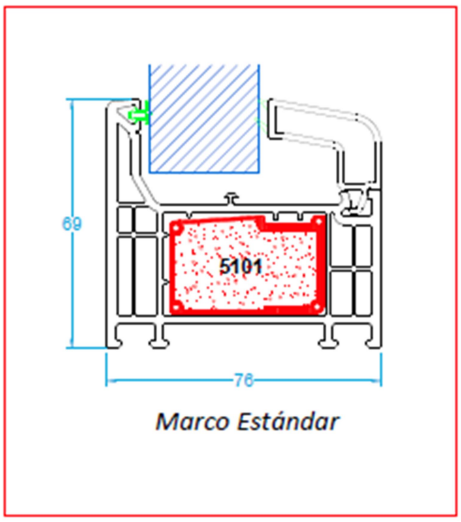
5.6 Windows

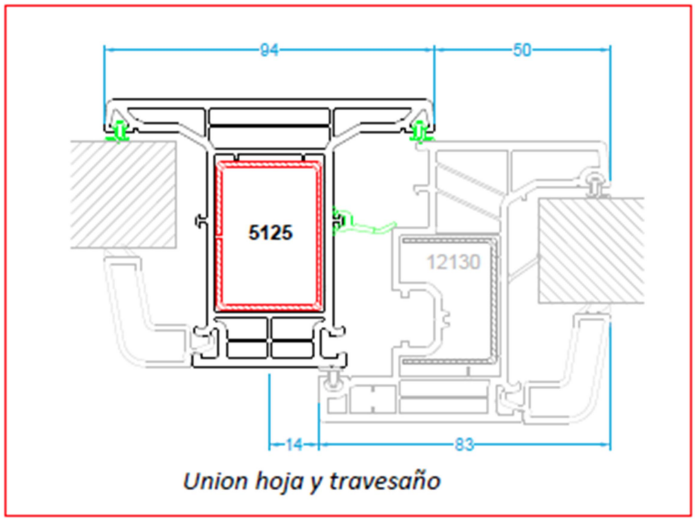
5.6.1 Window Frame

A certifícate window frame:
PVC DECEUNINCK, TOP 76 LEGEND (Component-ID 1098wi04)









Uf = 1.02 W/m2K

All windows have been placed using the “INFRONT OF WALL INSTALLATION SYSTEM ISO-TOP WINFRAMER, TYPE 1”

5.6.2 Glass

Type	U-Value (W/m^2K)	g-value (%)
4-ClimaGuard 1.0/16Arg/4/ClimaGuard1.0-4	0.505	0.372
4-ClimaGuard 1.0/16Arg/4/ClimaGuard1.0-4+4	0.565	0.371
4+4-ClimaGuard 1.0/16Arg/4/ClimaGuard1.0-4+4	0.503	0.351

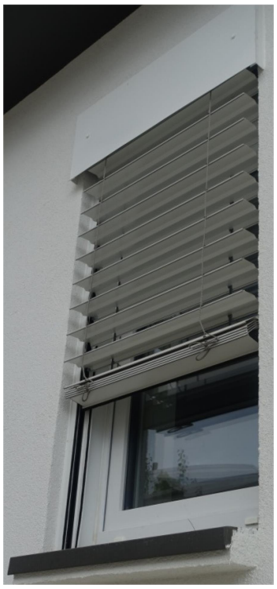
5.6.3 Spacers:

Thermix TX.N by ENSINGER GmbH

Psi value = 0.038 W/mK

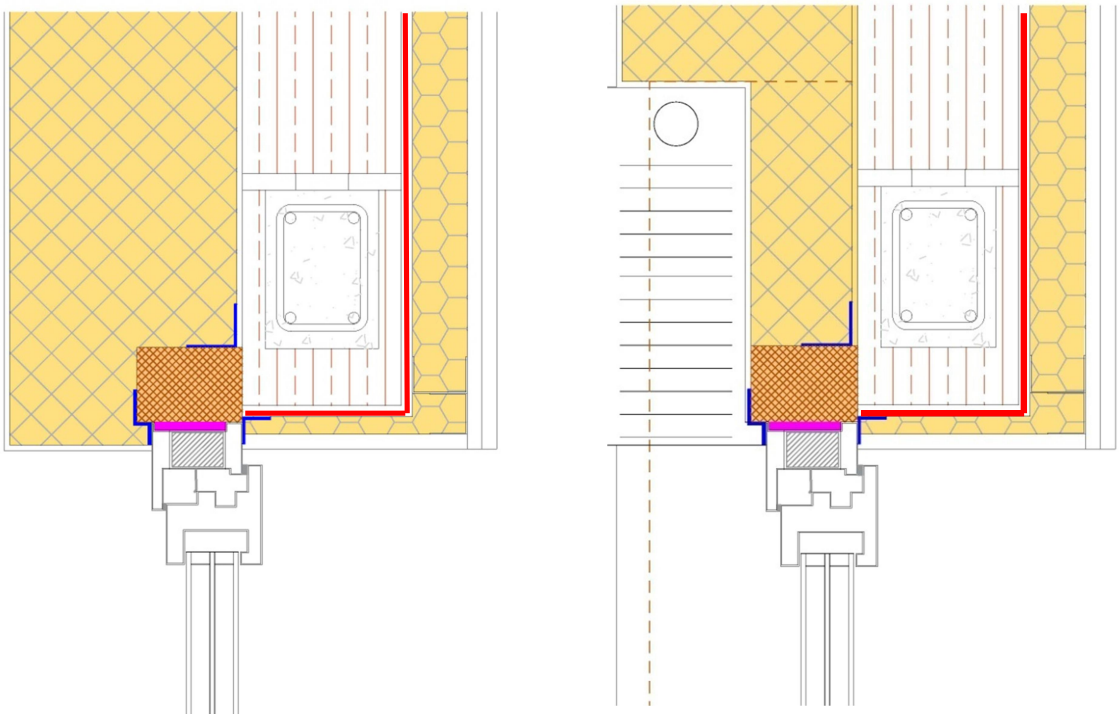
5.6.4 Shadow elements

External blinds were incorporated to provide solar protection during the summer months.

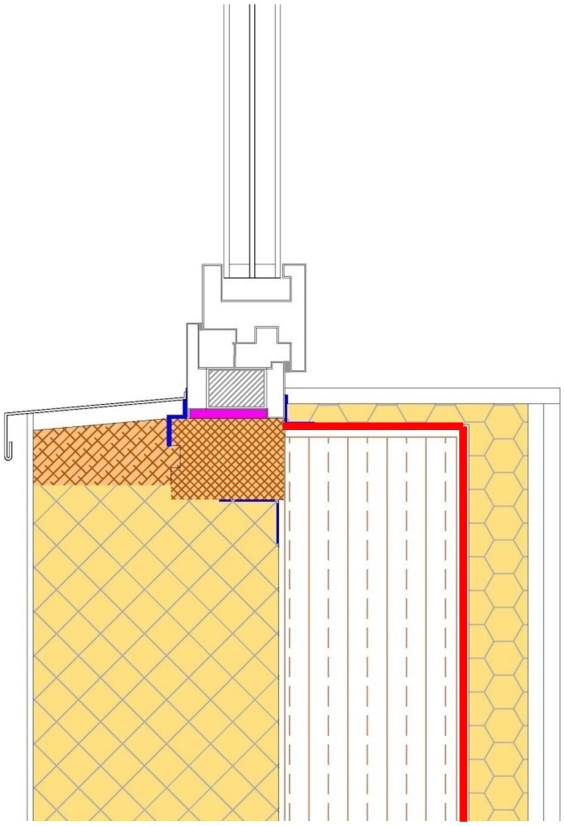


5.6.5 Window installation detail

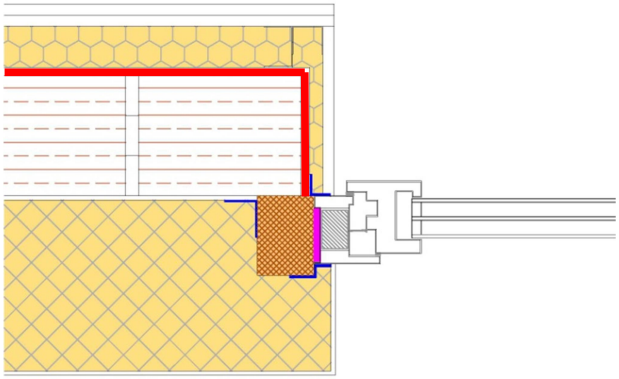
Top installation

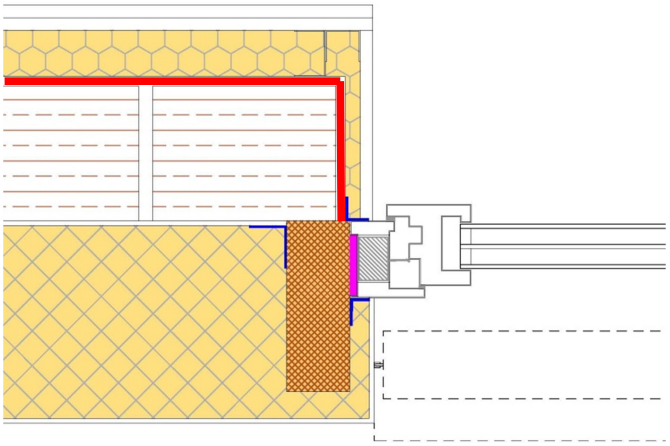


Bottom installation



Lateral installation





Blue line = airtight tape
Red line = airtight layer
Yellow line = termal envelope

5.7 Construction phase

Basement floor insulation

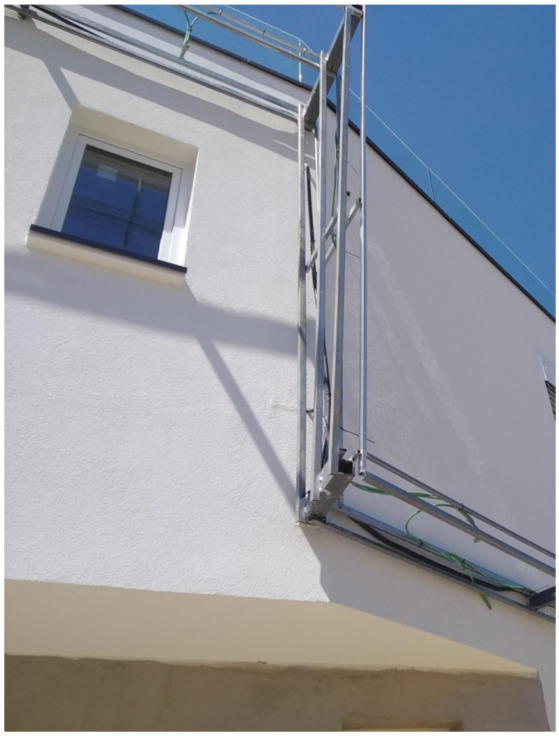
Basement wall insulation

ETICS Installation

Window installation

Window installation

External blind



Shadow elements

6 Airtightness

6.1 BlowerDoor test results

BlowerDoor GmbH
MessSysteme für Luftdichtheit

TEST DE INFILTRACIONES DEL EDIFICIO

Fecha del Test: 30/07/2020 Archivo de Test: 2020-07-30 TEST OBRA 1 depresurización y sobrepresión

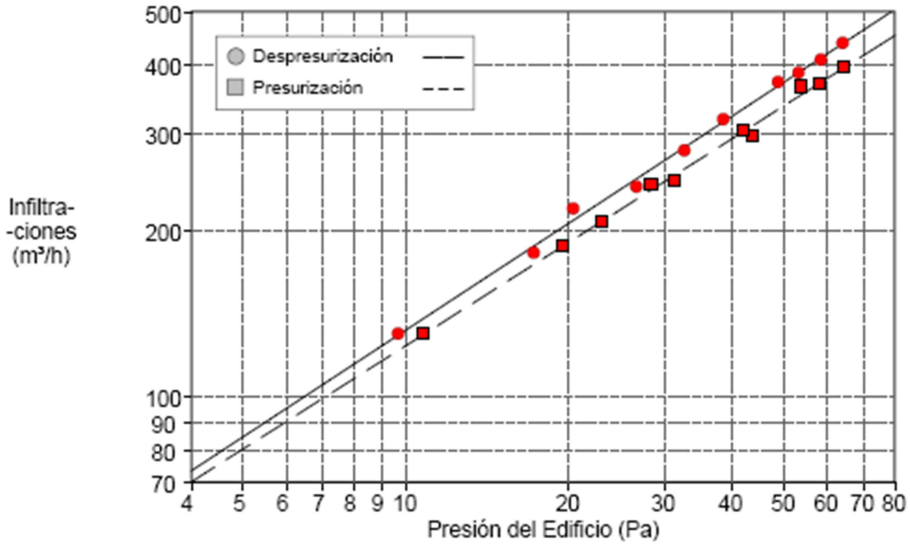
Técnico: Anne Vogt, Elia Ruiz
Número de proyecto: CLE

Cliente:

Dirección del Edificio: Casa Leira
C/Leira, 33
Madrid - 28043 Madrid

Resultados del test a 50 Pa:	Despresurización	Presurización	Media
q_{50} : m³/h (Caudal de Aire)	374 (+/- 2.3 %)	338 (+/- 2.2 %)	356
n_{50} : 1/h (Tasa de Renovación de Aire)	0.46	0.41	0.43
q_{F50} : m³/(h·m² Area del Suelo)	1.27	1.15	1.21
q_{E50} : m³/(h·m² Área de la Envolvente)	0.43	0.39	0.41
Áreas de Infiltraciones:			
ELA_{50} : m²	0.0114 (+/- 2.2 %)	0.0103 (+/- 2.2 %)	0.0109
ELA_{F50} : m²/m²	0.0000387	0.0000351	0.0000369
ELA_{E50} : m²/m²	0.0000131	0.0000118	0.0000125
Curva de Infiltraciones del Edificio:			
Coeficiente de Caudal de Aire (C_{env}) m³/(h·Pa^n)	31.7 (+/- 11.0 %)	30.9 (+/- 11.5 %)	
Coeficiente de Infiltraciones (C_L) m³/(h·Pa^n)	30.2 (+/- 11.0 %)	29.6 (+/- 11.5 %)	
Exponente (n)	0.643 (+/- 0.031)	0.623 (+/- 0.033)	
Coeficiente de Determinación (r^2)	0.99642	0.99590	

Norma del Test: ISO 9972
Modo del Test: Despresurización y Presurización
Método del Test: Método 1 - Test para el edificio en uso
Objetivo del test: Passivhaus n50 ≤ 0.6 1/h



Blower Door test report performed with TECTITE Express software

Información del Edificio

Volumen interno, V (m³) (De acuerdo a ISO)	820.72
Superficie neta, A_F (m²) (De acuerdo a ISO)	294.07
Área de la Envolvente, A_E (m²) (De acuerdo a ISO)	871.20
Altura (m)	2.80
Incertidumbre de las dimensiones (%)	5
Año de Construcción	2020
Tipo de calefacción	
Tipo de aire acondicionado	
Tipo de ventilación	VRC Alder
Exposición al viento del edificio	Edificio parcialmente expuesto
Tipo de viento	Brisa muy débil

Información del equipo

Tipo	Fabricante	Modelo	Número de Serie	Fecha de calibración
Ventilador	Energy Conservatory	Modelo 4 (230V)	CE5535	-
Micromanómetro	Energy Conservatory	DG700	63535	21/07/2016

Test de Presurización 1:

Datos Climáticos

Temperatura Interior (°C)	Temperatura Exterior (°C)	Presión Barométrica (Pa)
27.3	37.0	93174.0

Presión diferencial natural

Pre-test			Post-test		
$\Delta p_{0,1}$-	$\Delta p_{0,1}$+	$\Delta p_{0,1}$	$\Delta p_{0,2}$-	$\Delta p_{0,2}$+	$\Delta p_{0,2}$
-2.9	0.8	0.6	-1.1	0.8	0.3

Puntos de Datos - Test Automático (TTE 5.1.8.5)

Presión Nominal del Edificio (Pa)	Presión del edificio ajustada (Pa)	Presión del Ventilador (Pa)	Caudal Nominal q_r (m³/h)	Caudal de Aire Ajustado q_{env} (m³/h)	Caudal de Aire Ajustado q_L (m³/h)	% Error	Diafragma
0.6	---	---					
65.0	64.6	**24.3**	398	414	397	0.1	Diafragma B
58.4	58.0	**21.0**	370	385	369	-0.5	Diafragma B
53.9	53.5	**302.1**	367	381	366	3.7	Diafragma C
44.0	43.6	**202.0**	298	310	297	-4.3	Diafragma C
42.4	41.9	**213.0**	306	318	306	0.8	Diafragma C
31.7	31.3	**140.7**	247	257	247	-2.3	Diafragma C
28.8	28.4	**137.6**	245	254	244	2.6	Diafragma C
23.4	23.0	**101.2**	209	217	208	-0.1	Diafragma C
19.9	19.4	**83.0**	188	196	188	0.0	Diafragma C
11.2	10.7	**40.7**	131	136	130	0.3	Diafragma C
0.3	---	---					

Información – Datos de la medición

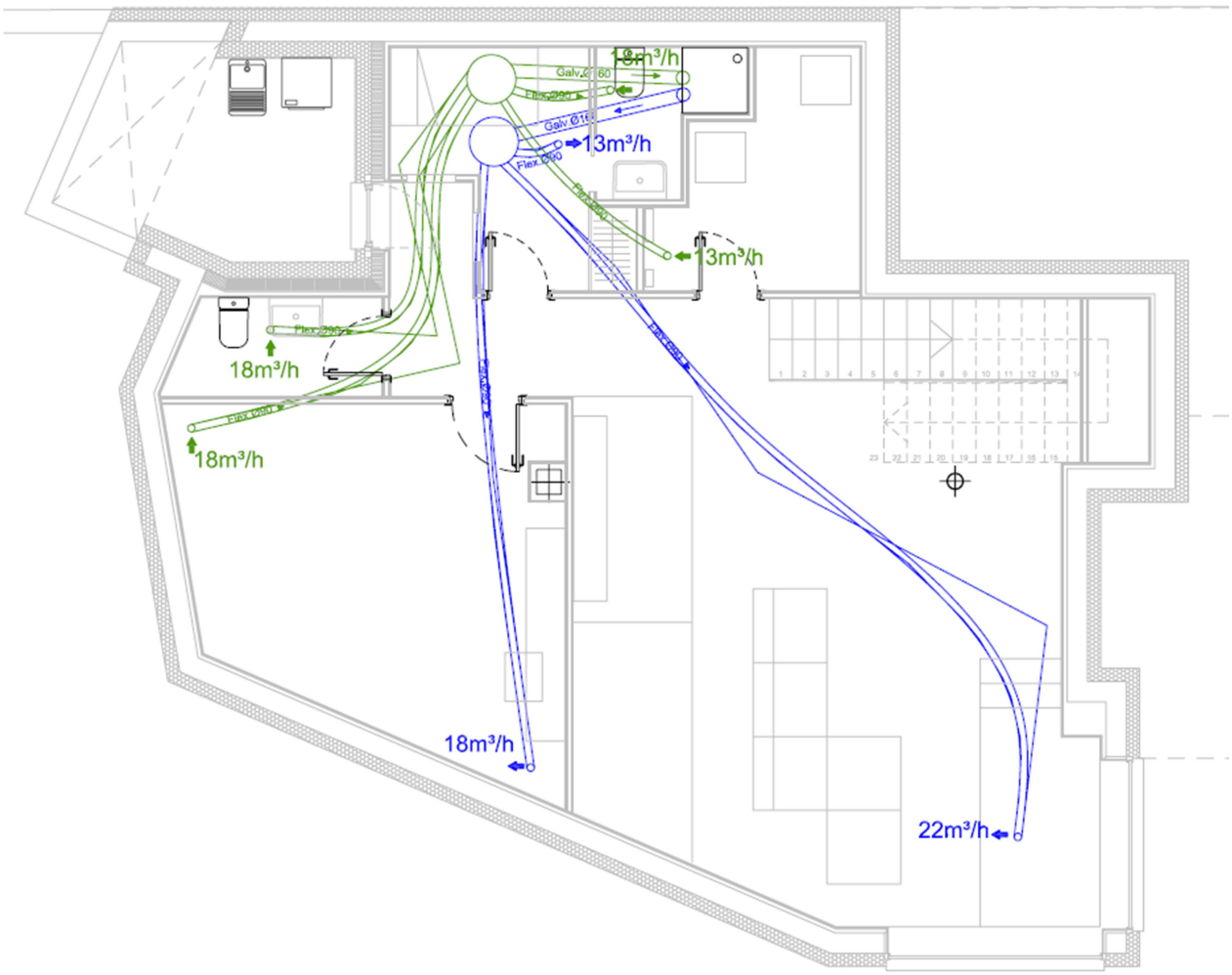
- Un intervalo entre presiones objetivo excede los 10 Pa.

6.2 Construction phase

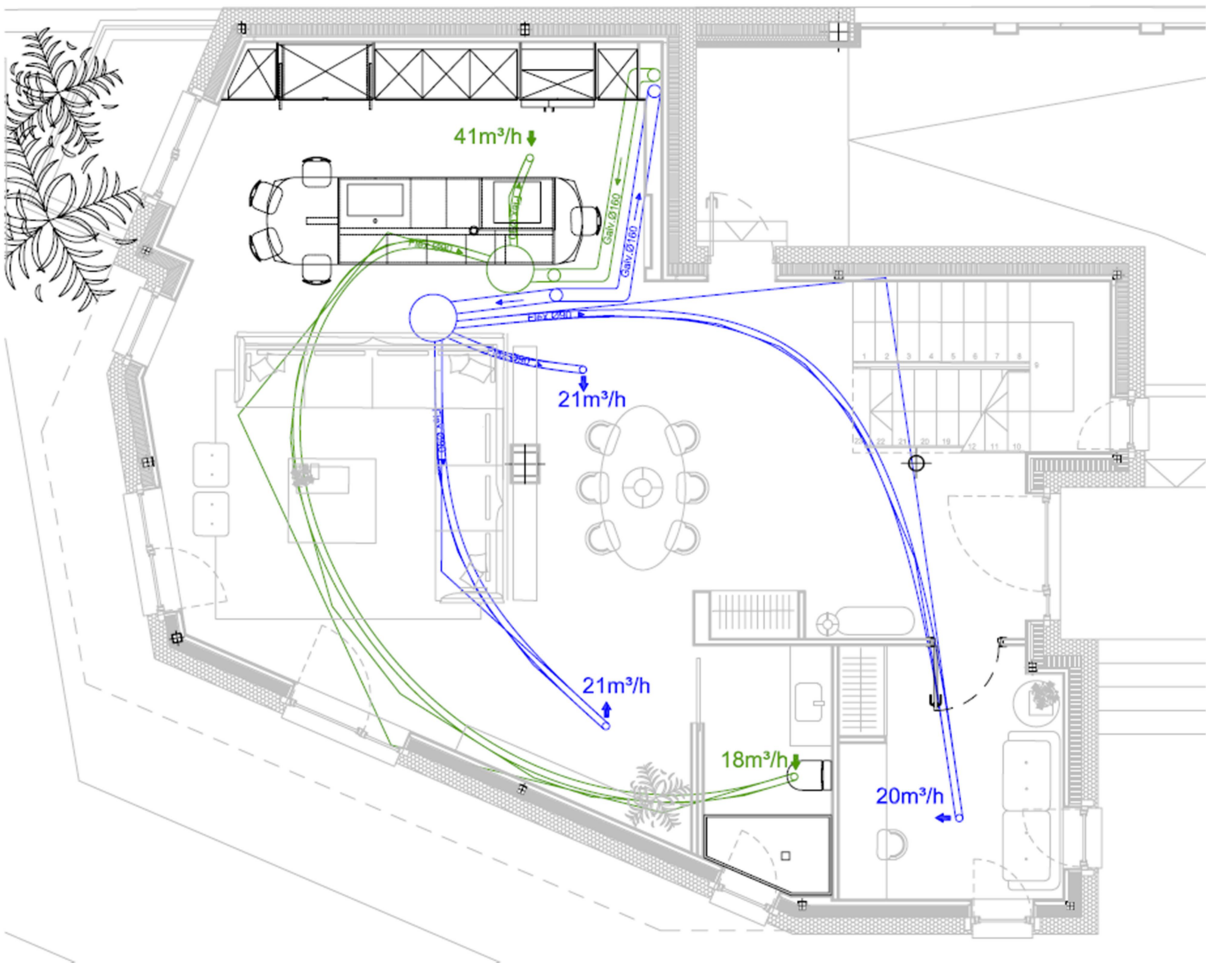
technology.
iso
CHEMIE
ZMIENNY
hnology.
iso
CHEM
ABILE \ ZMIENNY

7 Ventilation

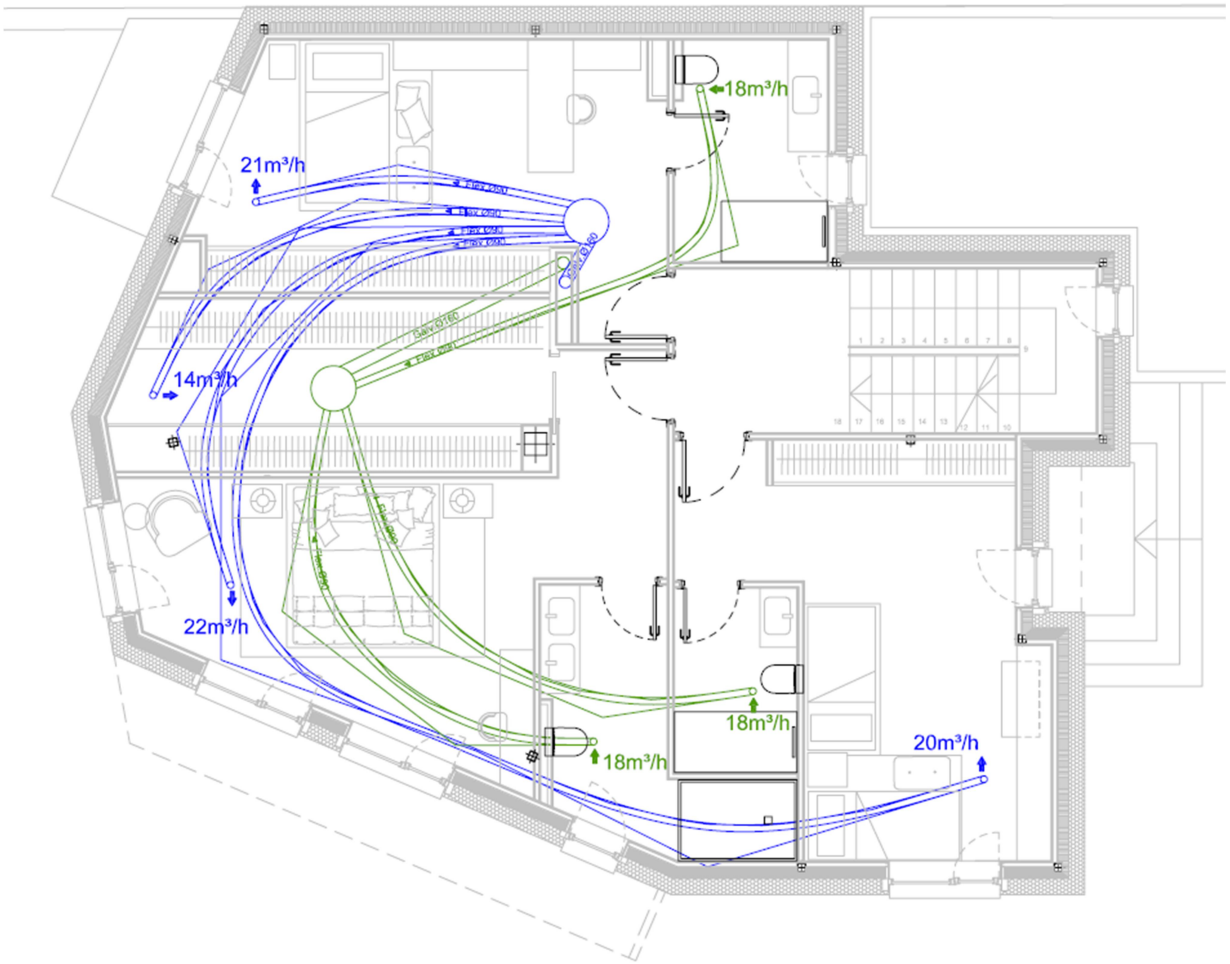
7.1 Ventilation planning



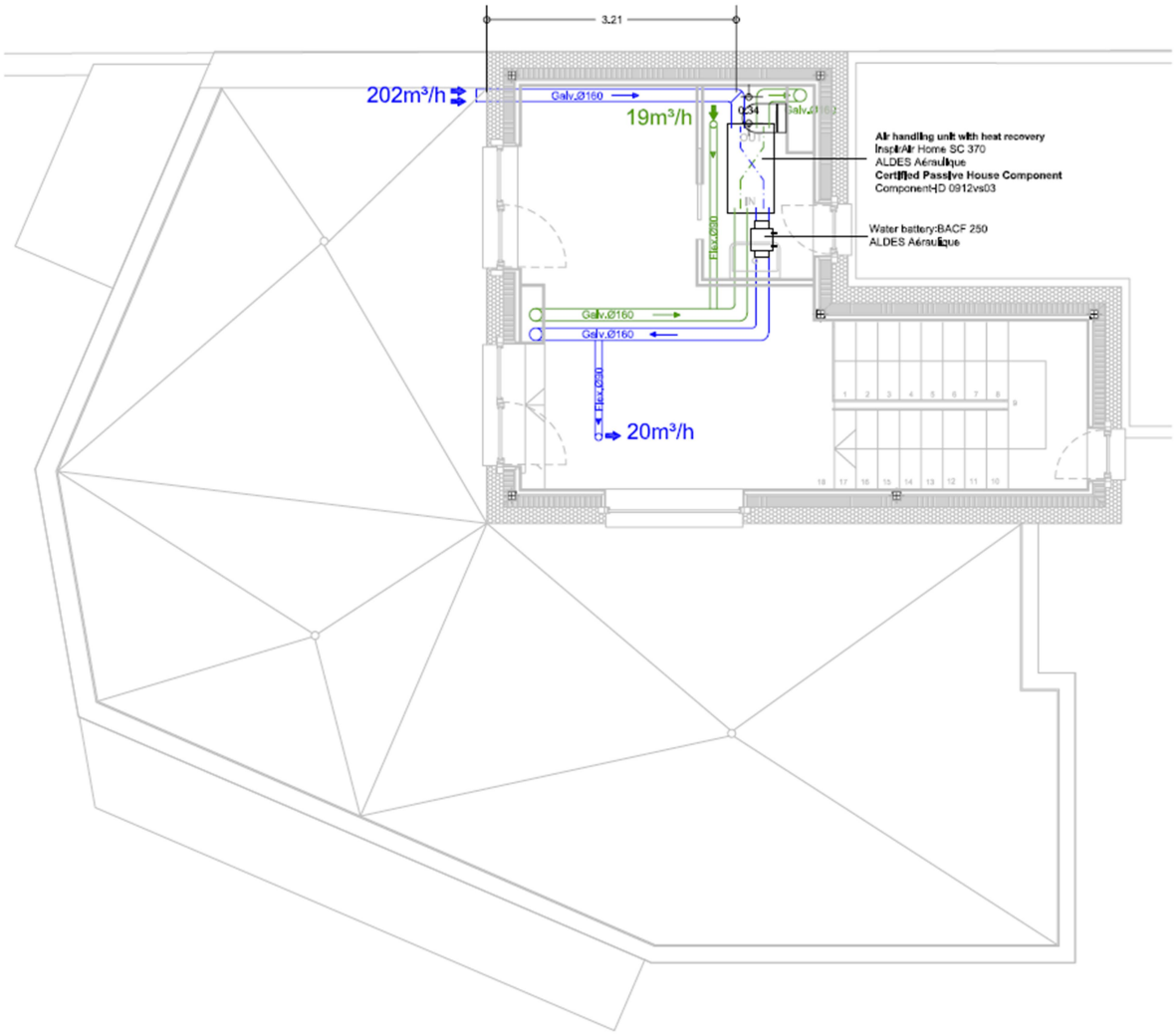
Basement floor



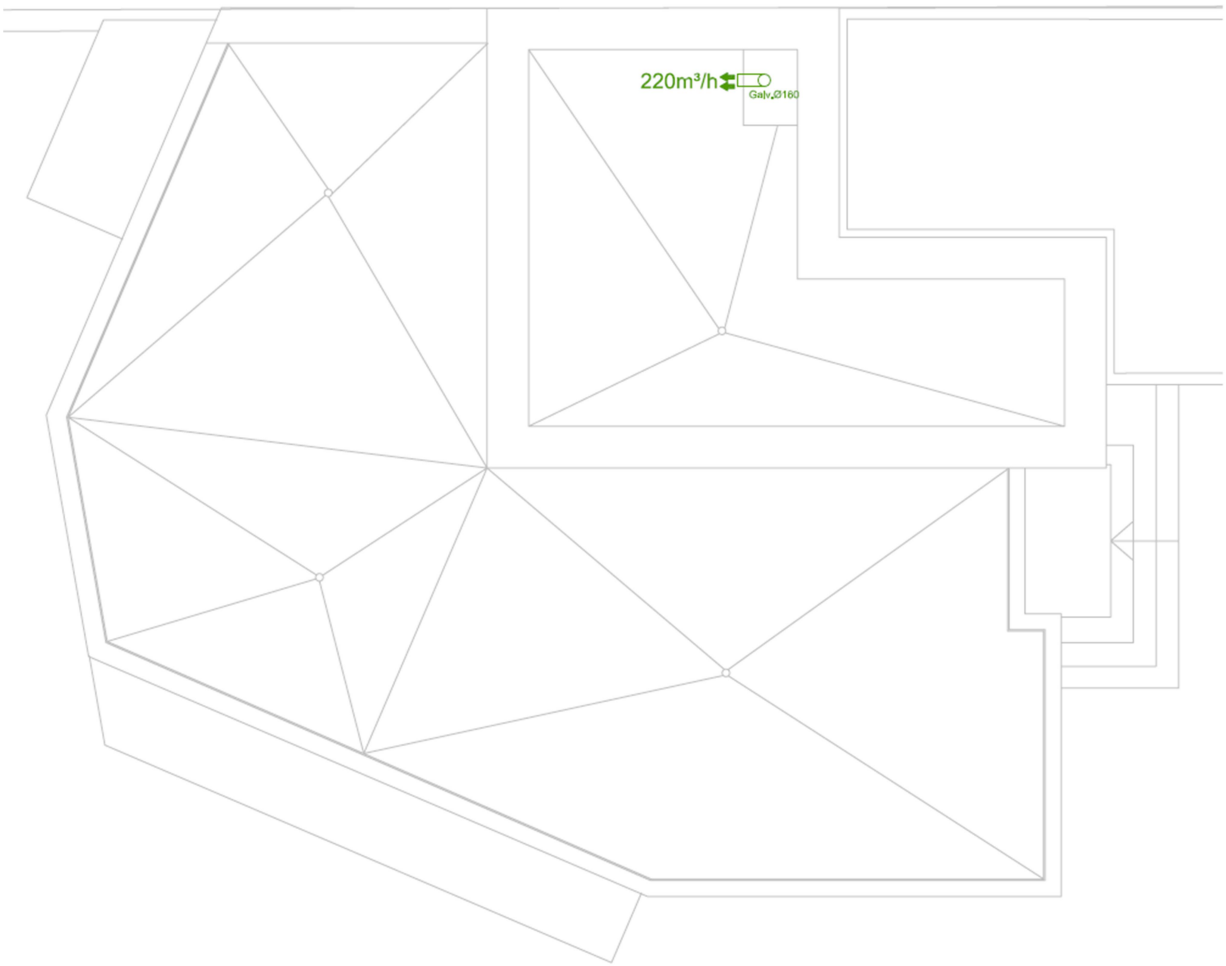
Ground floor



First floor



Second floor



Roof floor

7.2 Construction phase

7.3 Ventilation unit

Average air flow rate	Average air change rate	Heat recovery efficiency	Effective heat recovery efficiency unit	Specific power input
212 m^3/h	0.29 1/h	87%	85.3%	0.35 Wh/m^3

8 Building Services

An air-water heat pump is used for heating, cooling and domestic hot water. DAIKIN ALTHERMA ERGA04-08EVA with Hidrokit EHVX08S23D6V 230 l.

8.1 Heating/cooling

To provide both heating and cooling load, a radiant floor system has been installed in each floor. Besides, the air entering the mechanic ventilation unit, is post-treated by a water battery.

8.2 Domestic hot water

DHW with solar energy support DAIKIN DRAIN BACK system, using 1 DAIKIN EKSH26P high efficiency solar collector panel with a surface area of 2.60 m2 and DAIKIN EKHWP-B 300l accumulator tank.

8.3 Renewable Energy

With 8 photovoltaic solar panels, polycrystalline type and 340 Wp, combined with an inverter (3kW)

9 PHPP Results

Casa Pasiva Comprobación

Edificio:	Vivienda unifamiliar		
Calle:	Leira 33		
CP / Ciudad:	28043	Madrid	
Provincia/País:	Madrid	ES-España	
Tipo de edificio:	Vivienda unifamiliar pareada		
Datos climáticos:	ES0001b-Madrid		
Zona climática:	4: Cálida-templada	Altitud de la localización:	710 m
Propietario / cliente:	Alberto Martínez Álvarez-Carolina López Herrera		
Calle:	Leira 33		
CP / Ciudad:	28043	Madrid	
Provincia/País:	Madrid	ES-España	

Arquitectura:	Ramón Puñet Corvillo		
Calle:	Gaztambide 68		
CP / Ciudad:	28010	Madrid	
Provincia/País:	Madrid	ES-España	
Ingeniería:	Juan Miñé Gómez		
Calle:	Emilio Carrere 7		
CP / Ciudad:	28015	Madrid	
Provincia/País:	Madrid	ES-España	
Consult. energética:	Juan Miñé Gómez		
Calle:	Emilio Carrere 7		
CP / Ciudad:	28015	Madrid	
Provincia/País:	Madrid	ES-España	
Certificación:			
Calle:			
CP / Ciudad:			
Provincia/País:			

Año construcción:	2020	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]:	2.3	GIC caso refrig. [W/m²]:	4.2
Nr. de personas:	3.2	Capacidad específica [Wh/K por m² de SRE]:	158	Refrigeración mecánica:	x

Valores específicos del edificio con referencia a la superficie de referencia energética

						Criterio	Criterios alternativos	¿Cumplido?[2]
	Superficie de referencia energética	m²	292.5					
Calefacción	Demanda de calefacción	kWh/(m²a)	16	≤		15	-	Sí
	Carga de calefacción	W/m²	9	≤		-	10	
Refrigeración	Demanda refrigeración & deshum.	kWh/(m²a)	10	≤		15	15	Sí
	Carga de refrigeración	W/m²	8	≤		-	10	
	Frecuencia de sobrecalentamiento (> 25 °C)	%	-	≤		-		-
	Frecuencia excesivamente alta humedad (> 12 g/kg)	%	0	≤		10		Sí
Hermeticidad	Resultado ensayo presión n_{50}	1/h	0.4	≤		0.6		Sí
Energía Primaria no renovable (EP)	Demanda EP	kWh/(m²a)	57	≤		-		-
Energía Primaria Renovable (PER)	Demanda PER	kWh/(m²a)	36	≤		60	60	Sí
	Generación de Energía Renovable (en relación con área de la huella del edificio proyectado)	kWh/(m²a)	16	≥		-	-	

[2] Celda vacía: Falta dato; '-': Sin 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.

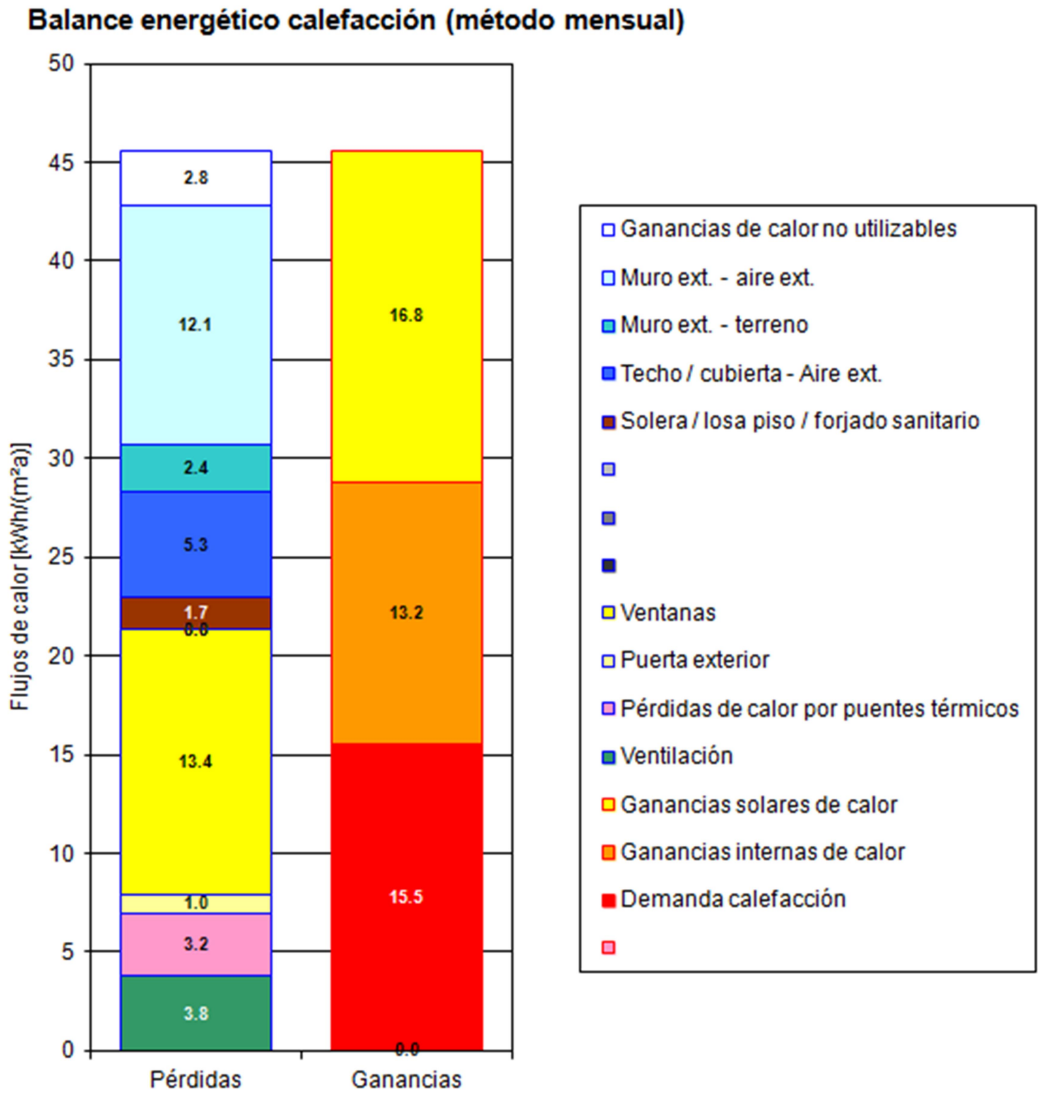
¿Casa Pasiva Classic? Sí

Función:	Nombre:	Apellido:
1-Diseñador	Juan	Miñé

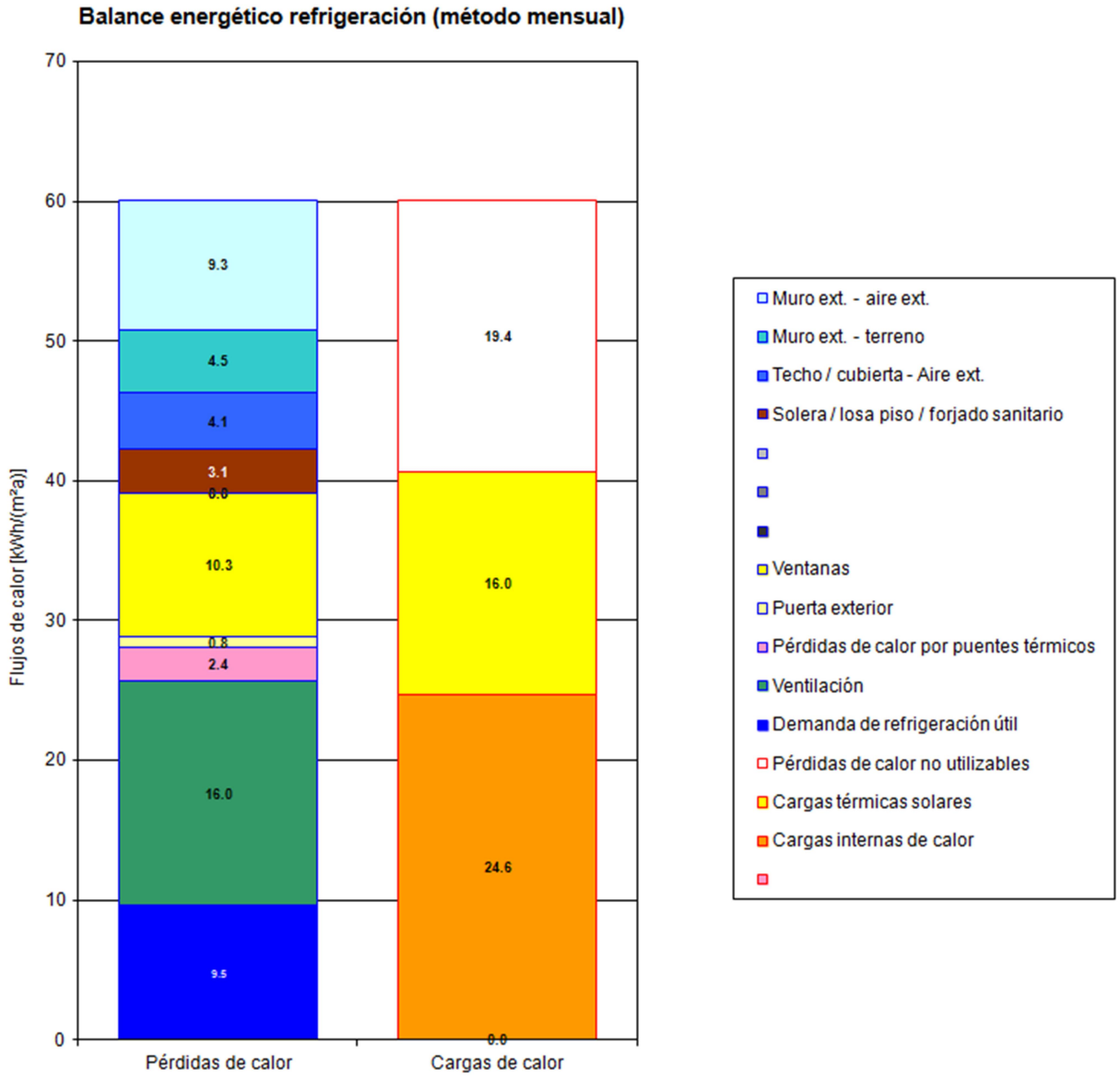
Emisión:	Ciudad:
25/05/21	Madrid

Firma:

Energy balance heating



Energy balance cooling



10 Costs

Overal costs: 1.577,41 €/m^2

Building costs:: 461.455,52 €