DETACHED SINGLE-FAMILY HOUSE IN VALDEPARES (ASTURIAS), SPAIN

Casa Pasiva certificada Passive House Institute | clásica | plus | premium |

1 Abstract

1.1 Data of building

Year of construction	2019	**Space heating**	**13 kWh/(m²a)**
Area	152,40 m²		
U-value external wall	TIPE 1: 0.160 W/(m²K) TIPE 2: 0.156 W/(m²K) TIPE 3: 0.151 W/(m²K) TIPE 4: 0.147 W/(m²K) TIPE 5: 0.156 W/(m²K) TIPE 6: 0.147 W/(m²K)		
U-value partition wall with garage	0,181 W/(m²K)		
U-value floor	0.211 W/(m²K)	**Primary Energy Renewable (PER)**	32 kWh/(m²a)
U-value roof	TIPE 1: 0.168 W/(m²K) TIPE 2: 0.173 W/(m²K) TIPE 3: 0.203 W/(m²K)	**Generation of renewable energy**	0 kWh/(m²a)
U-value window	1.02 W/(m²K)	**Non-renewable Primary Energy (PE)**	53 kWh/(m²a)
Heat recovery	80,1 %	**Pressure test n50**	0.5 h-1

1.2 Brief Description

DETACHED SINGLE-FAMILY HOUSE IN VALDEPARES (ASTURIAS), SPAIN

This passive single-family home was designed in an L shape, seeking the best orientation of each space: the day area to the south and the night area to the east and west. The building has 152,40 m2 and is distributed on one floor; It consists of living room-kitchen, study area over the living room creating a double height, 3 bedrooms and 2 bathrooms. Adjacent to the house, we find the garage and the engine room, both outside the passive envelope.

It is located in Valdepares (Asturias), a coastal area with a temperate but humid climate.

1.3 Responsible project participants

Architect	Melisa de la Iglesia García
Implementation planning	Método Crea 44, SLU
Building systems	Método Crea 44, SLU
Structural engineering	Método Crea 44, SLU
Building physics	Melisa de la Iglesia García
Passive House project planning	Melisa de la Iglesia García
Construction management	Método Crea 44, SLU

Certifying body/ Zertifizierungsstelle	VAND arquitectura		
Certification ID/ Zertifizierungs ID	30236	Project-ID (www.passivehouse-database.org)	6598

Author of project documentation / Verfasser der Gebäude-Dokumentation	Melisa de la Iglesia García
Date, Signature/ Datum, Unterschrift	Tapia de Casariego, 05/07/2021

2 Pictures of the project

2.1 Exterior photographs

East view 2

South-West view 1

South-West view 2

North-West view

2.2 Interior photographs

Day zone 1

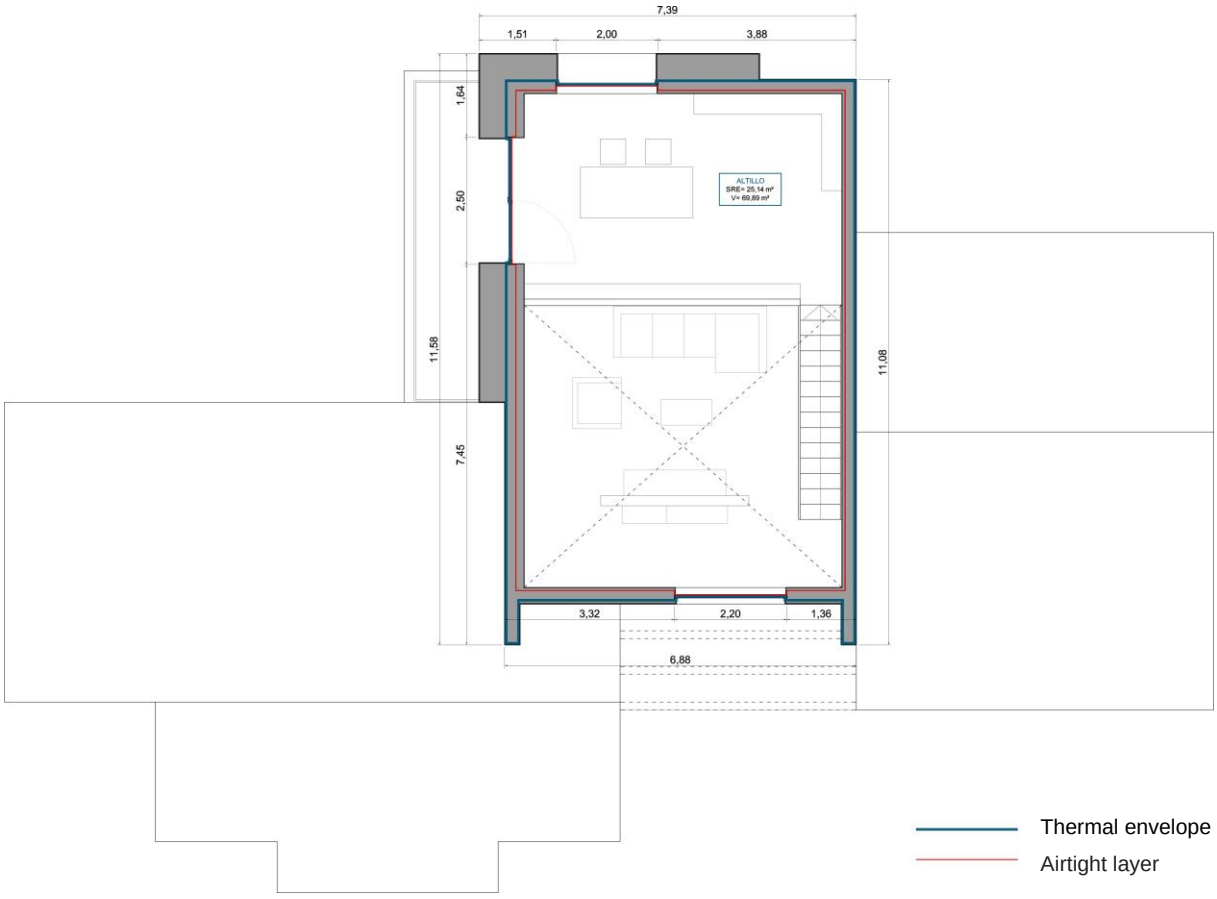
Day zone 2

Bathroom 1

Bathroom 2

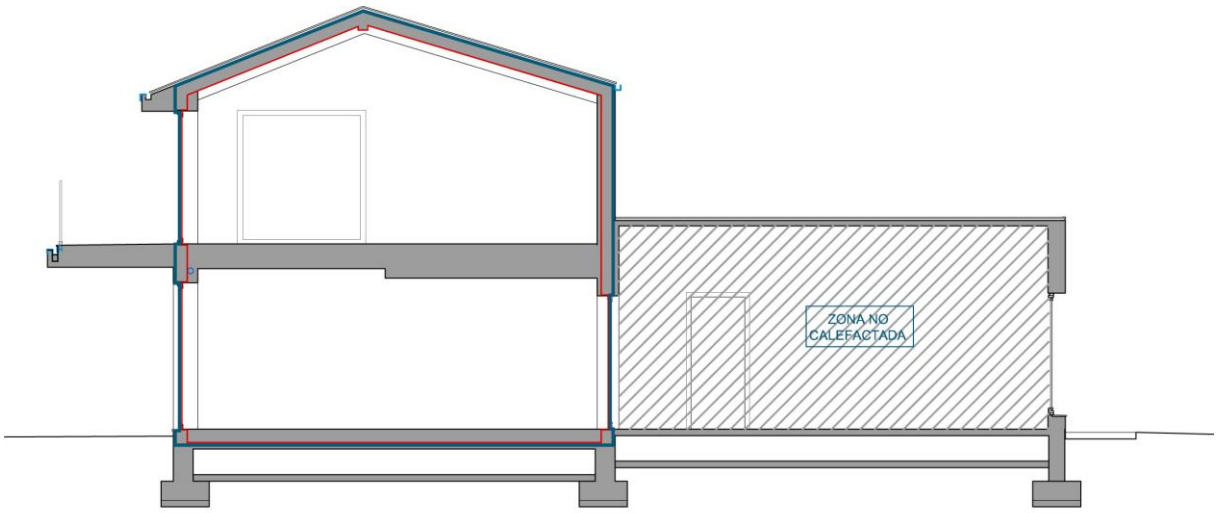
3 Plans

Ground floor

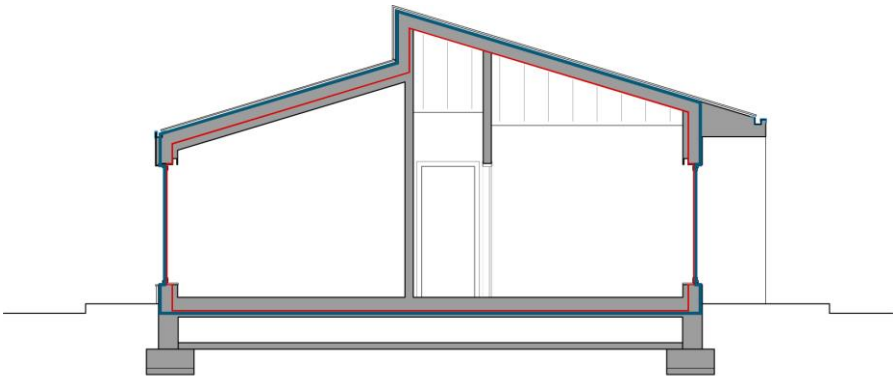

7,39
1,51
2,00
3,88
1,64
2,50
11,58
7,45
11,08
ALTILLO
SRE= 25,14 m²
V= 69,89 m³
3,32
2,20
1,36
6,88
Thermal envelope
Airtight layer

First floor

Sections:



Thermal envelope Airtight layer

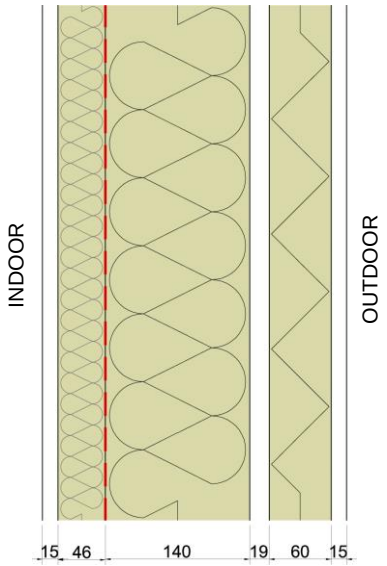


Thermal envelope Airtight layer

4 Technical details of the construction

4.1 Exterior walls

TYPE 1 - U-value= 0,160 W/(m^{2}K)



INDOOR

Plasterboard - 15 mm

Insulation (λ=0,037) - 46 mm

AIRTIGHT LAYER

Timber framing with insulation (λ=0,032) between wooden studs - 140 mm

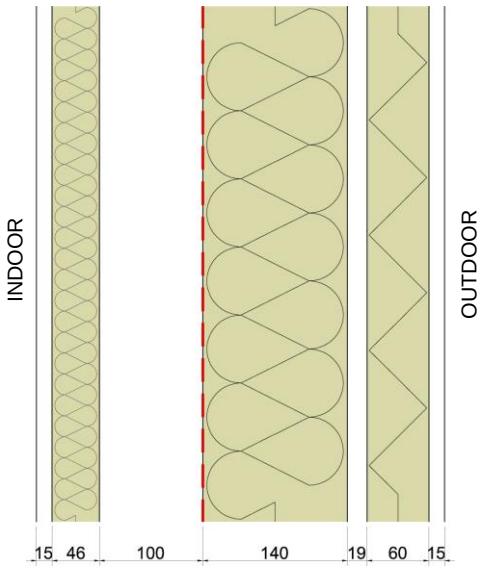
Wooden board - 19 mm

Exterior thermal insulation composite system (λ=0,032) - 60 mm

Mortar - 15 mm

OUTDOOR

TYPE 2 - U-value= 0,156 W/(m^{2}K)



INDOOR

Plasterboard - 15 mm

Insulation (λ=0,037) - 46 mm

Air chamber - 100 mm

AIRTIGHT LAYER

Timber framing with insulation (λ=0,032) between wooden studs - 140 mm

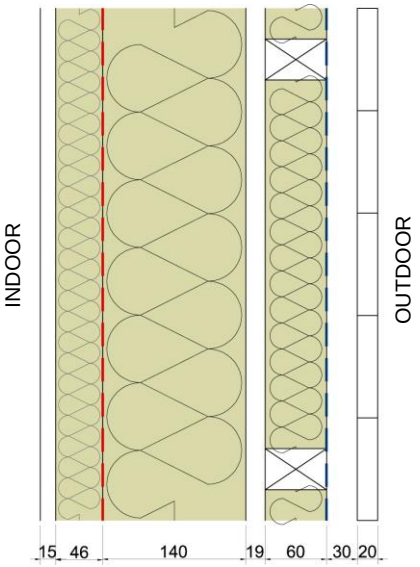
Wooden board - 19 mm

Exterior thermal insulation composite system (λ=0,032) - 60 mm

Mortar - 15 mm

OUTDOOR

TYPE 3 - U-value= 0,151 W/(m^{2}K)



INDOOR

Plasterboard - 15 mm

Insulation (λ=0,037) - 46 mm

AIRTIGHT LAYER

Timber framing with insulation (λ=0,032) between wooden studs - 140 mm

Wooden board - 19 mm

Insulation between battens (λ=0,032) - 60 mm

Ventilated facade sheet

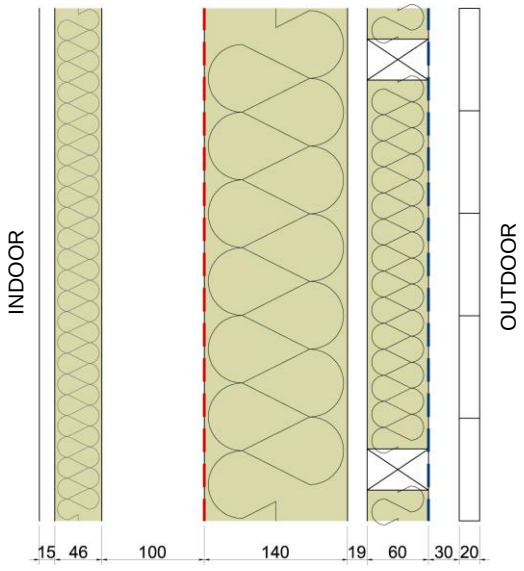
Ventilated air chamber - 30 mm

Wooden slats - 20 mm

OUTDOOR

TYPE 4 - U-value= 0,147 W/(m^{2}K)

INDOOR



Plasterboard - 15 mm

Insulation (λ=0,037) - 46 mm

Air chamber - 100 mm

AIRTIGHT LAYER

Timber framing with insulation (λ=0,032) between wooden studs - 140 mm

Wooden board - 19 mm

Insulation between battens (λ=0,032) - 60 mm

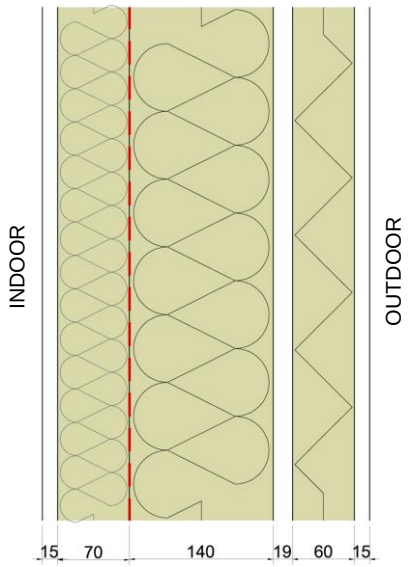
Ventilated facade sheet

Ventilated air chamber - 30 mm

Wooden slats - 20 mm

OUTDOOR

TYPE 5 - U-value= 0,156 W/(m2K)



INDOOR

Plasterboard - 15 mm

Insulation (λ=0,037) - 70 mm

AIRTIGHT LAYER

Timber framing with insulation (λ=0,032) between wooden studs - 140 mm

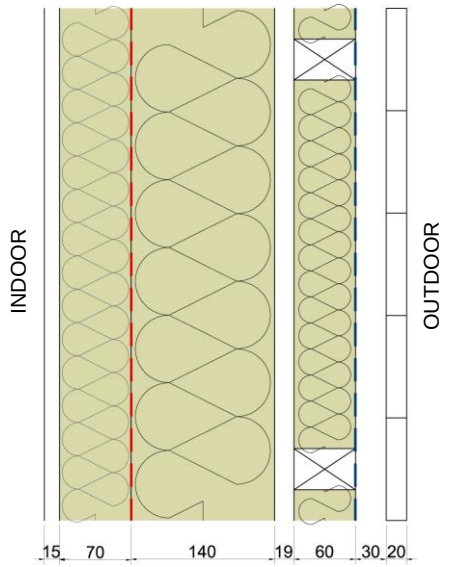
Wooden board - 19 mm

Exterior thermal insulation composite system (λ=0,032) - 60 mm

Mortar - 15 mm

OUTDOOR

TYPE 6 - U-value= 0,147 W/(m2K)



INDOOR

Plasterboard - 15 mm

Insulation (λ=0,037) - 70 mm

Air chamber - 100 mm

AIRTIGHT LAYER

Timber framing with insulation (λ=0,032) between wooden studs - 140 mm

Wooden board - 19 mm

Insulation between battens (λ=0,032) - 60 mm

Ventilated facade sheet

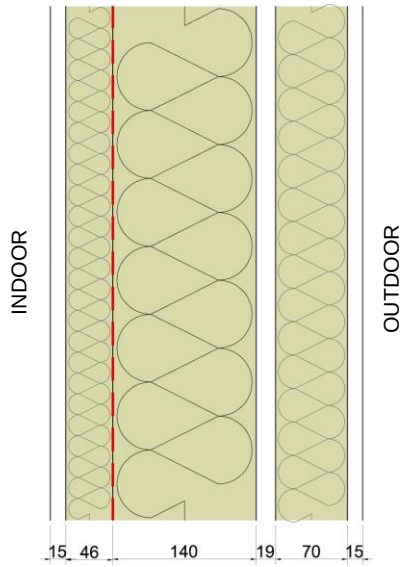
Ventilated air chamber - 30 mm

Wooden slats - 20 mm

OUTDOOR

4.2 Partition wall with garage

U-value= 0,181 W/(m2K)



INDOOR

Plasterboard - 15 mm

Insulation (λ=0,037) - 46 mm

AIRTIGHT LAYER

Timber framing with insulation (λ=0,032) between wooden studs - 140 mm

Wooden board - 19 mm

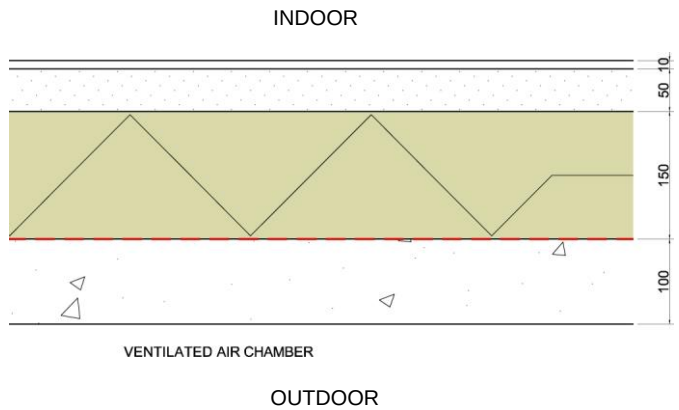
Insulation (λ=0,037) - 70 mm

Plasterboard - 15 mm

OUTDOOR

4.3 Floor

U-value= 0,211 W/(m2K)



INDOOR

Pavement - 10 mm

Mortar - 50 mm

Insulation (λ=0,035) - 150 mm

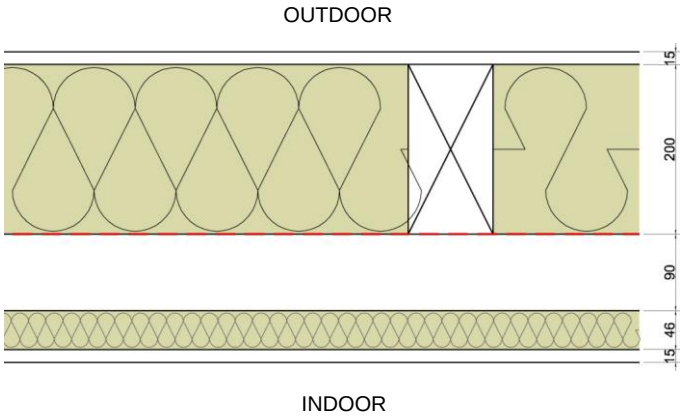
AIRTIGHT LAYER

Concrete - 100 mm

OUTDOOR

4.4 Roof

TYPE 1 - U-value= 0,168 W/(m2K)



OUTDOOR

Wooden board - 15 mm

Insulation between wood beams (λ=0,032) - 200 mm

AIRTIGHT LAYER

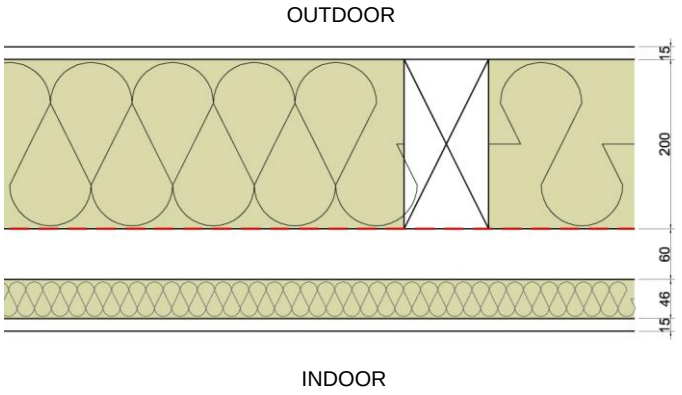
Air chamber - 90 mm

Insulation (λ=0,037) - 46 mm

Plasterboard - 15 mm

INDOOR

TYPE 2 - U-value= 0,173 W/(m2K)



OUTDOOR

Wooden board - 15 mm

Insulation between wood beams (λ=0,032) - 200 mm

AIRTIGHT LAYER

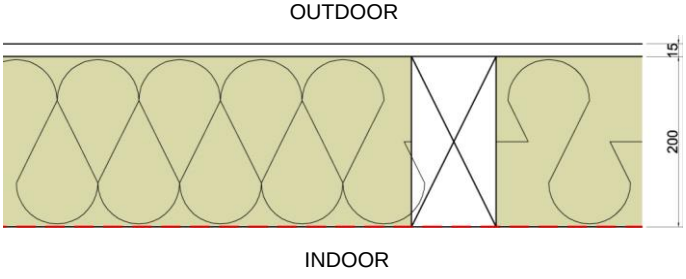
Air chamber - 60 mm

Insulation (λ=0,037) - 46 mm

Plasterboard - 15 mm

INDOOR

TYPE 3 - U-value= 0,203 W/(m2K)



OUTDOOR

Wooden board - 15 mm

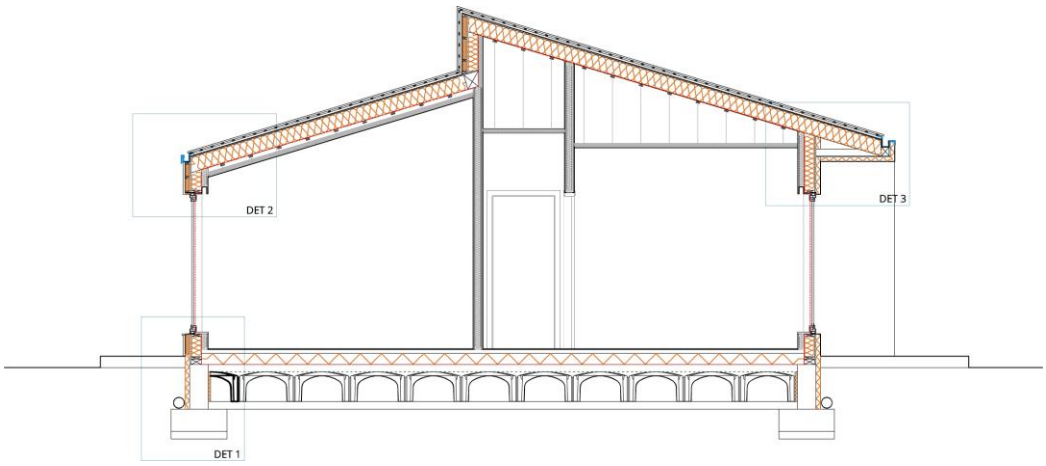
Insulation between wood beams (λ=0,032) - 200 mm

AIRTIGHT LAYER

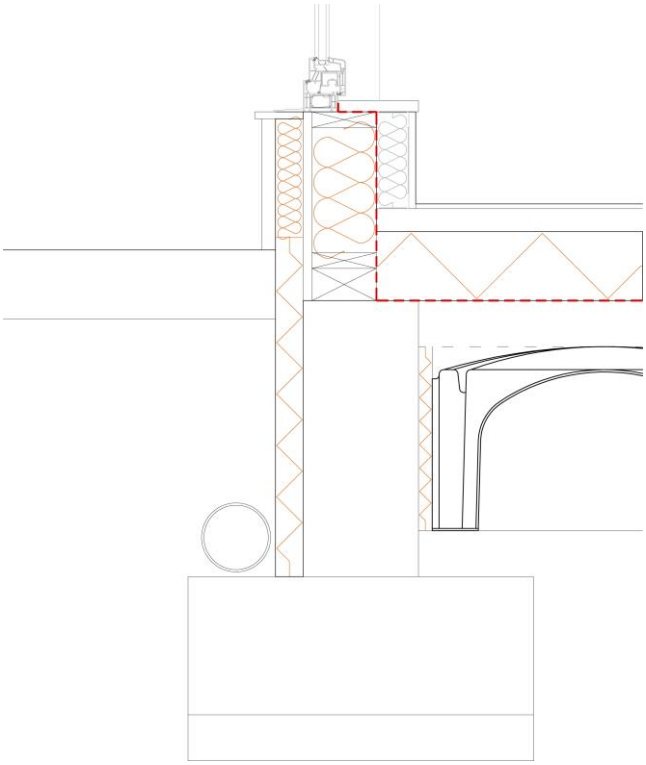
INDOOR

4.5 Constructive details

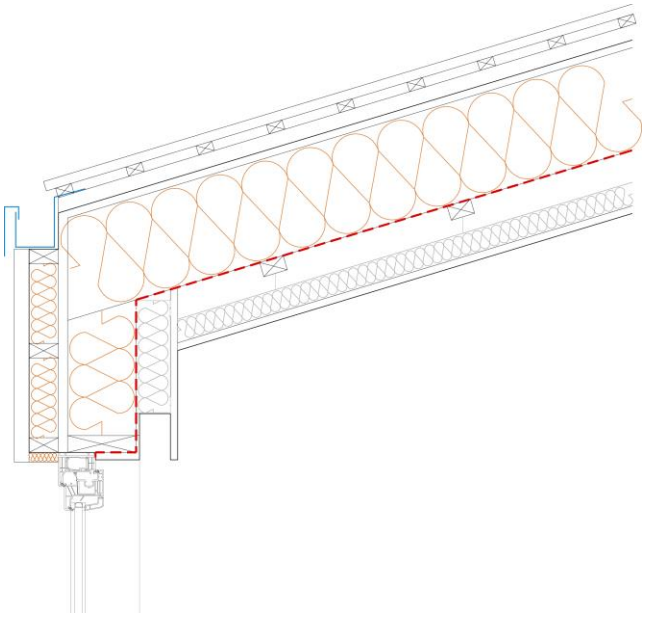
CONSTRUCTIVE SECTION 1



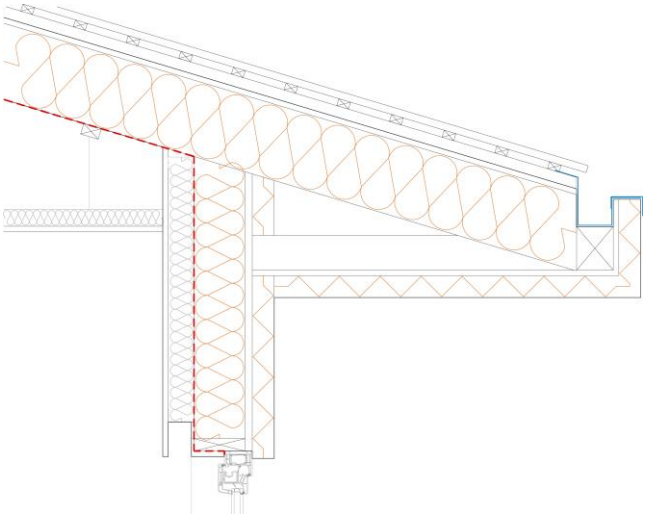
CONSTRUCTIVE SECTION 1



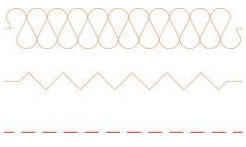
DETAIL 1: Wall - Floor



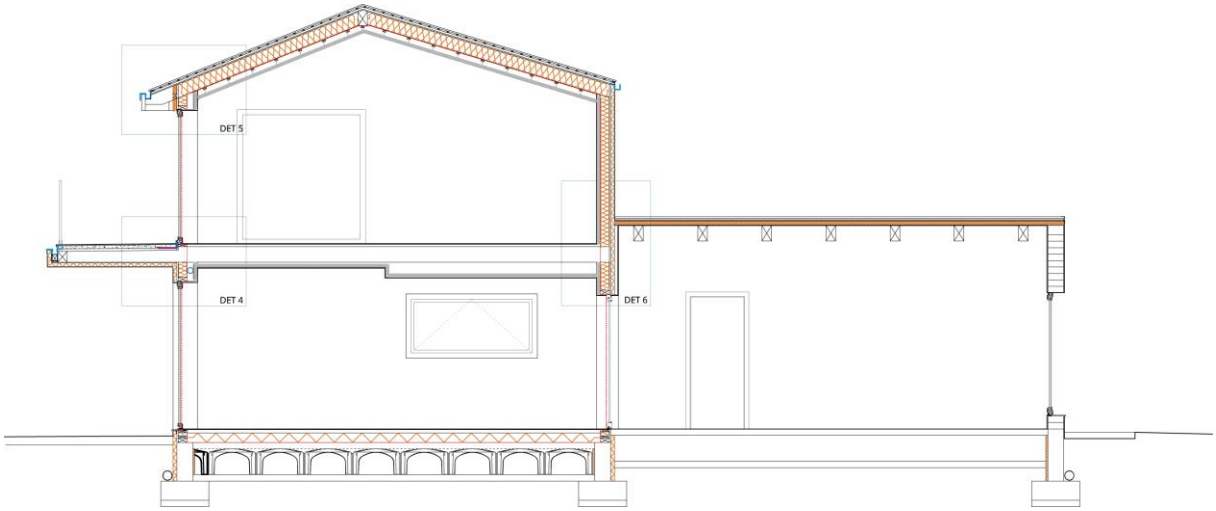
DETAIL 2: Roof – Wall



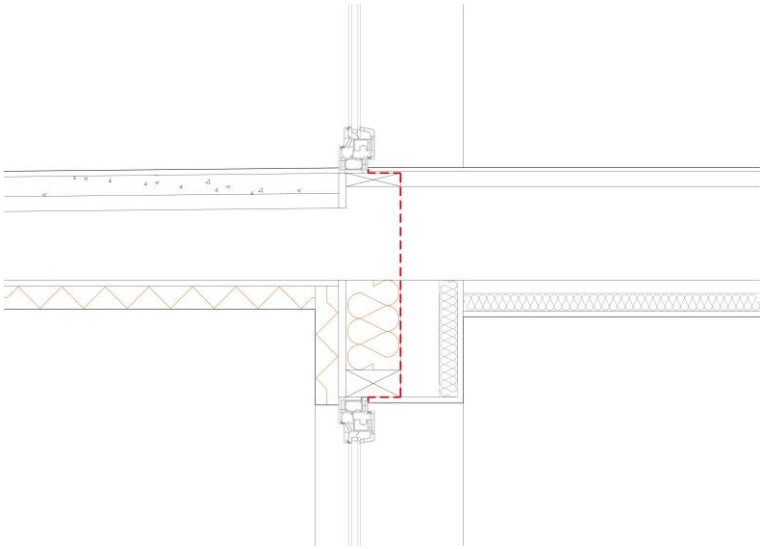
DETAIL 3: Roof with eaves – Wall



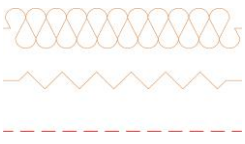
CONSTRUCTIVE SECTION 2



CONSTRUCTIVE SECTION 2

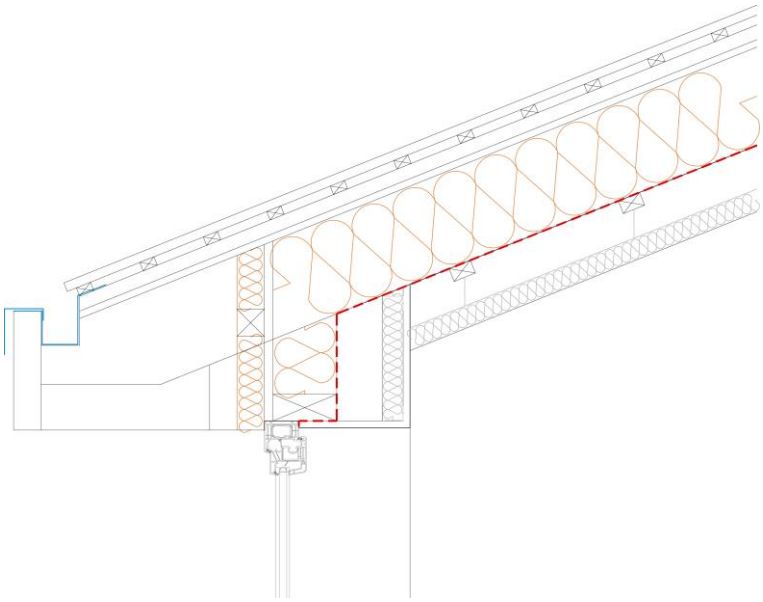


DETAIL 4: Wall – First floor

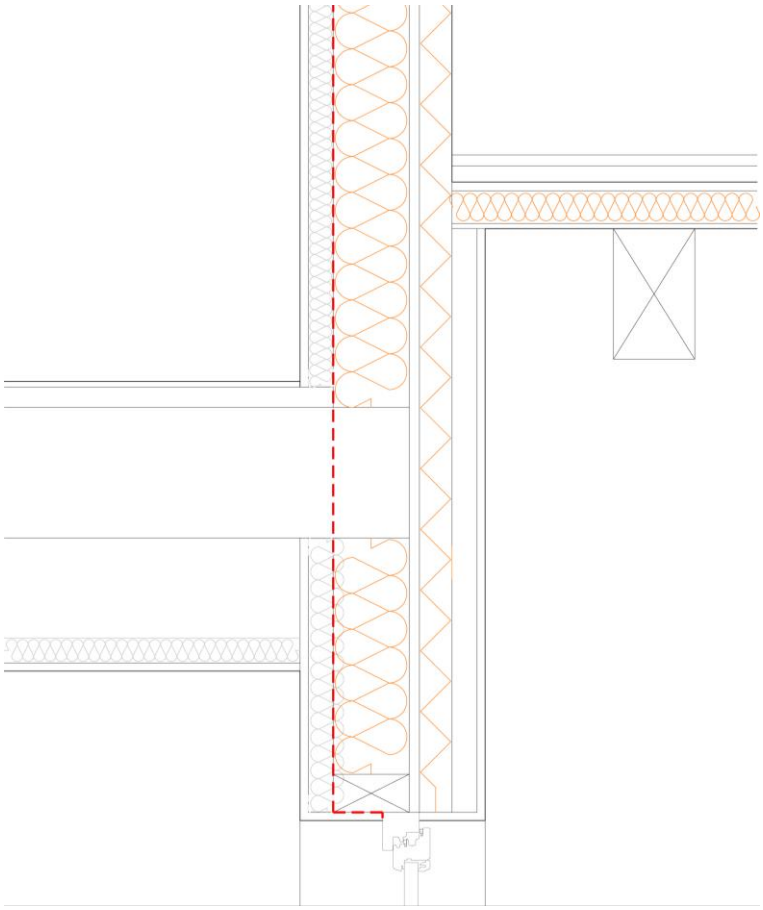


THERMAL ENVELOPE

AIRTIGHT LAYER



DETAIL 5: Roof – Wall

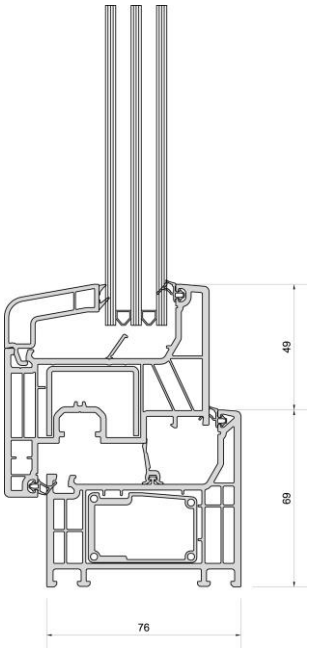


DETAIL 6: Wall – First floor

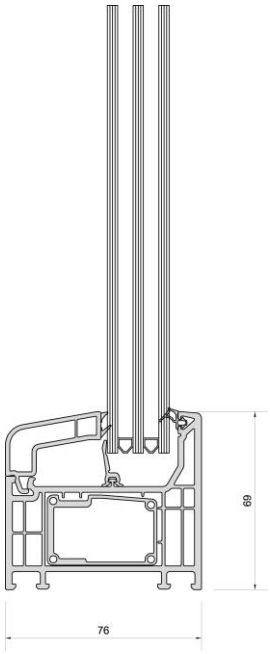
4.6 Windows

WINDOWS FRAME: PVC

CASEMENT WINDOWS



FIXED WINDOWS



U_f = 1,02 W/(m2K)

GLASS

TYPE 1: 4+4(Planistar One)/14Arg/4(Planitherm XN)/12Arg/3+3

Ug= 0,64 W/(m2K) g= 0,33

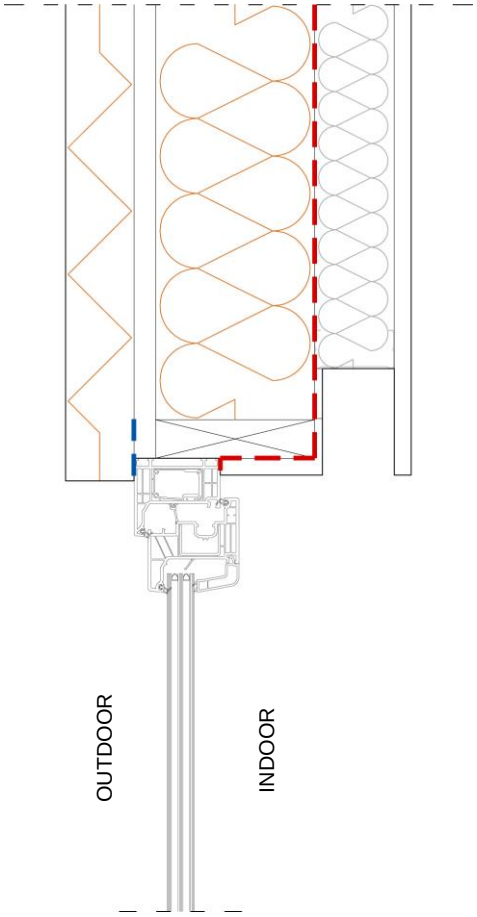
TYPE 2: 4(Planistar One)/16Arg/4(Planitherm XN)/12Arg/4

Ug= 0,54 W/(m2K) g= 0,34

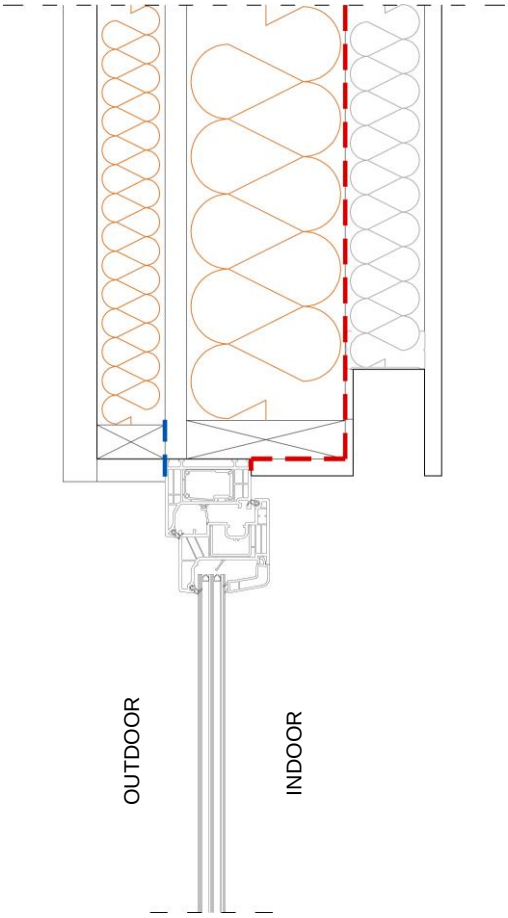
4.7 Window installation detail

TOP INSTALLATION

EXTERIOR THERMAL INSULATION COMPOSITE SYSTEM

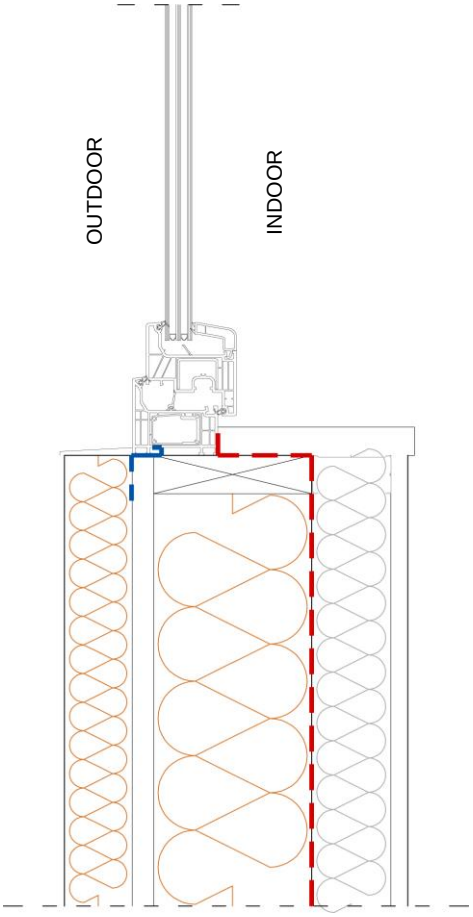


VENTILATED FACADE

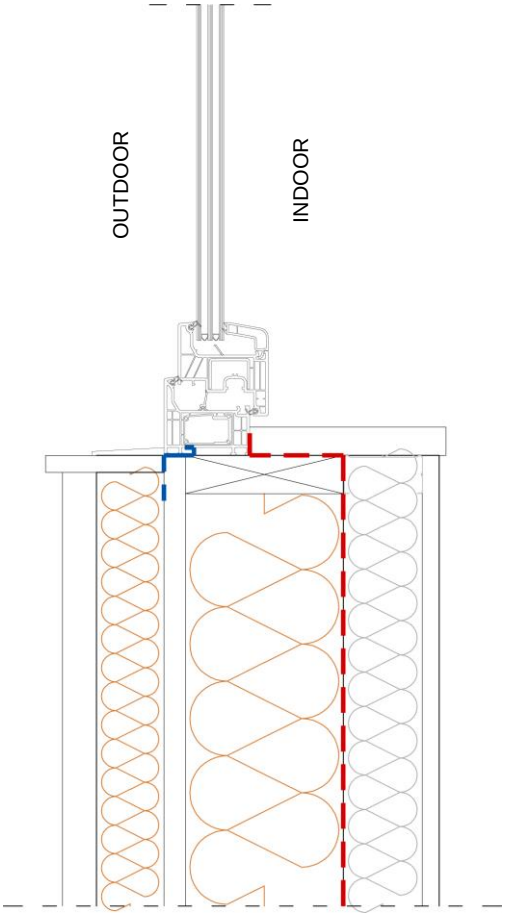


LOWER INSTALLATION

EXTERIOR THERMAL INSULATION COMPOSITE SYSTEM

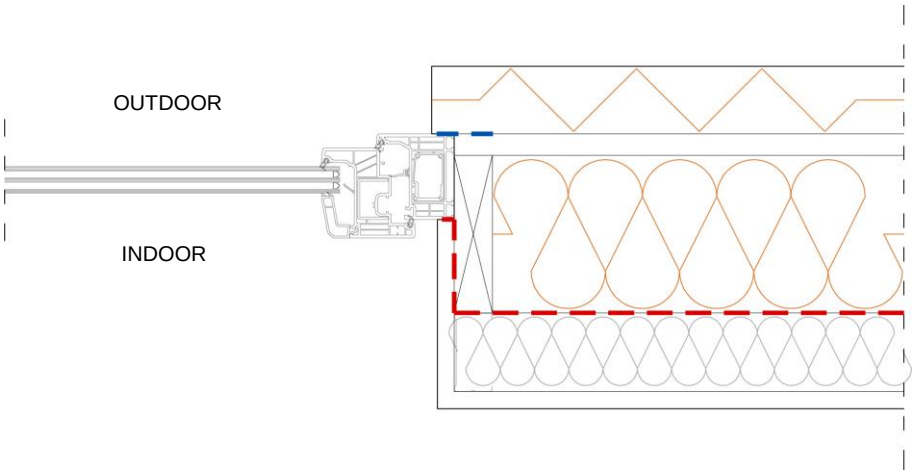


VENTILATED FACADE

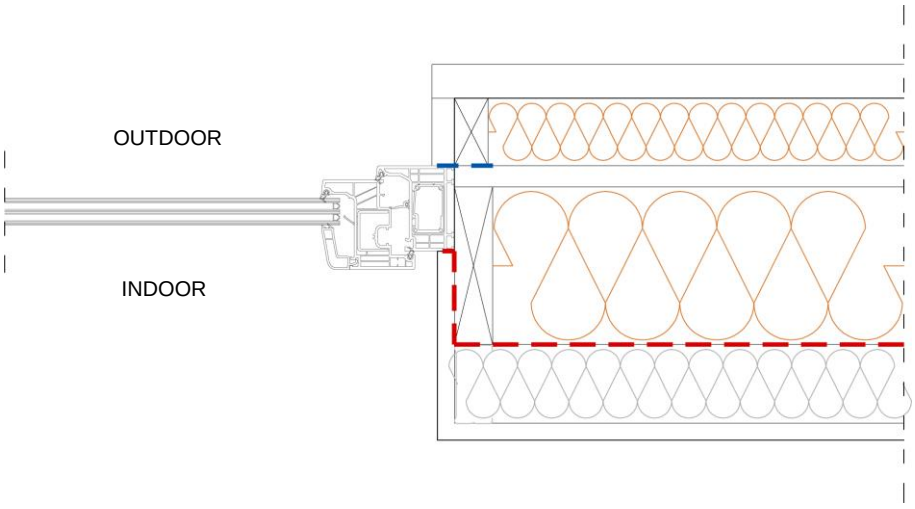


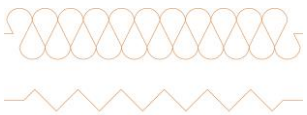
SIDE INSTALLATION

EXTERIOR THERMAL INSULATION COMPOSITE SYSTEM



VENTILATED FACADE





THERMAL ENVELOPE

AIRTIGHT LAYER

4.8 Construction phase

Foundation

Timber framing with insulation between wooden studs

ETICS

Ventilated facade insulation

Partition wall with garage insulation

Airtight layer



Windows installation

4.9 Thermal bridges

Thanks to the use of wooden timber frame as a construction system and to the use of the thermal insulation system on the outside, the thermal bridges are very low.

The exterior insulation starts at the footing to minimize the thermal bridge that occurs with the ground.

Exterior insulation starts in the footing

Insulation between studs reduces thermal bridges at corners

5 Airtight layer

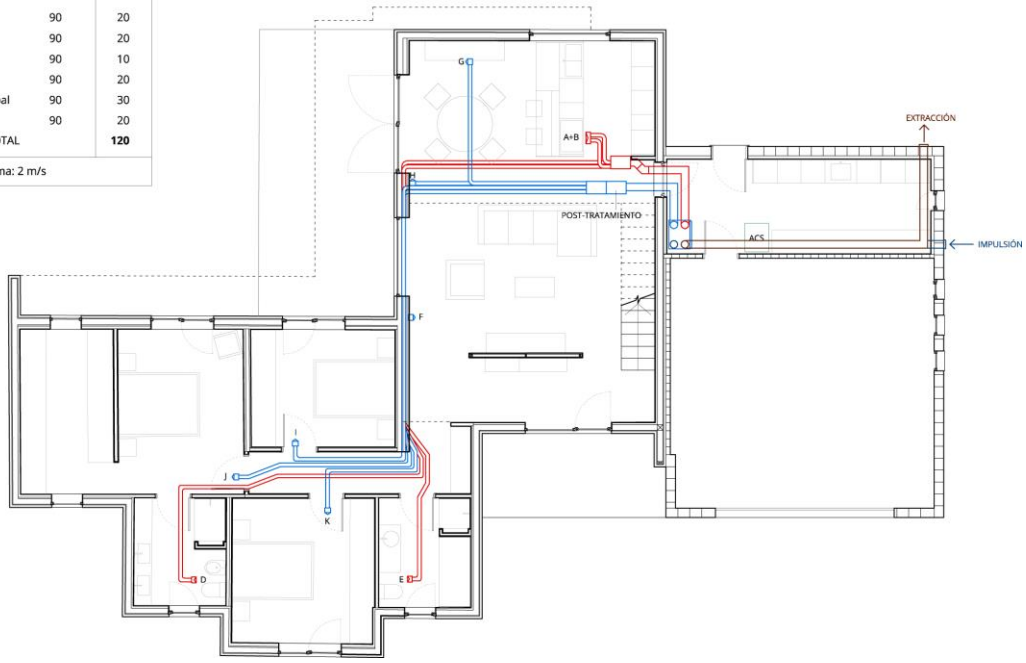
Inside, the airtight layer on ceilings and vertical walls is made with SIGA Majpell 5 airtightness sheet. On the ground, this sheet is sealed against the 10 cm thick concrete of the ground floor.

The airtight outer layer is made of Superpan Tech P5 board, sealing its joints.

6 Ventilation

6.1 Ventilation planning

VENTILACIÓN				
BOCAS	SITUACIÓN BOCAS		Diámetro	m3/h
		EXTRACCIÓN		
A + B	Falso techo	Cocina	90	60
D	Falso techo	Baño dormitorio	90	30
E	Falso techo	Baño común	90	30
		TOTAL		**120**
		IMPULSIÓN		
F	Trasdosado	Salón	90	20
G	Falso techo	Comedor	90	20
H	Suelo	Altillo	90	10
I	Falso techo	Dormitorio 1	90	20
J	Falso techo	Dorm. principal	90	30
K	Falso techo	Dormitorio 2	90	20
		TOTAL		**120**
Velocidad máxima: 2 m/s				



6.2 Construction phase

Ventilation installation

6.3 Ventilation unit

ZEHNDER COMFOAIR Q350				
Average air flow rate (m^3/h)	Average air change rate (h^{-1})	Heat recovery efficiency	Effective heat recovery efficiency unit	Specific power input (Wh/m^3)
120 m^3/h	**0,31 h^{-1}**	**90 %**	**80,1 %**	**0,24 Wh/m^3**

7 Building Services

7.1 Heating / Cooling

The heating load required in this home is provided by a battery, connected to the air-to-water heat pump, which heats the supply air from the mechanical ventilation system.

In addition, this battery also cools the supply air in summer, despite not being necessary according to the calculations obtained in the PHPP.

7.2 Domestic hot water

The demand for domestic hot water is covered by an air-water heat pump that recovers the heat from the outside air.

Indoor unit

Outdoor unit

8 PHPP Results

Casa Pasiva Comprobación

Edificio:	Vivienda Unifamiliar Pasiva en Valdepares		
Calle:	La Barraca, s/n, Valdepares		
CP / Ciudad:	33746	El Franco	
Provincia/País:	Asturias		ES-España
Tipo de edificio:	Vivienda Unifamiliar en Valdepares		
Datos climáticos:	ES0032a-Santander		
Zona climática:	4: Cálida-templada	Altitud de la localización:	56 m
Propietario / cliente:	Pablo Martínez Fernández / Lucía Pérez Vizcaíno		
Calle:	La Barraca, s/n, Valdepares		
CP / Ciudad:	33746	El Franco	
Provincia/País:	Asturias		ES-España

Arquitectura:	Melisa de la Iglesia García		
Calle:	Viñas da Veiga, nº 53, 2º C		
CP / Ciudad:	27740	Mondoñedo	
Provincia/País:	Lugo		ES-España
Ingeniería:	Método Crea 44, SLU		
Calle:	Concello de Sarria, 23, local 7, bajo		
CP / Ciudad:	27780	Foz	
Provincia/País:	Lugo		ES-España
Consult. energética:	Método Crea 44, SLU		
Calle:	Concello de Sarria, 23, local 7, bajo		
CP / Ciudad:	27780	Foz	
Provincia/País:	Lugo		ES-España
Certificación:	Nuria Díaz Antón-VAND Arquitectura		
Calle:	C/ Finisterre, 8, Local 2		
CP / Ciudad:	28029	Madrid	
Provincia/País:	Madrid		ES-España

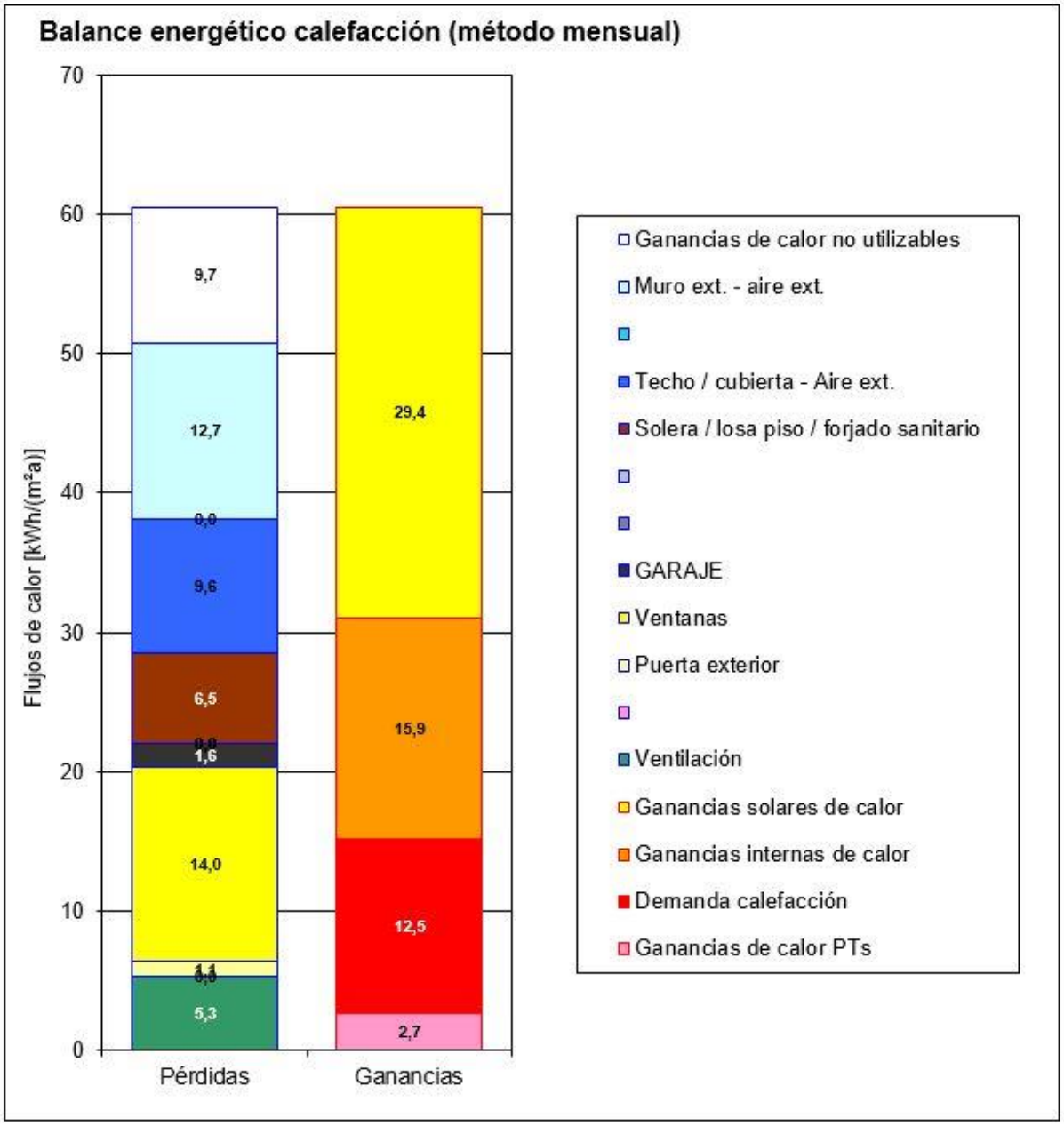
Año construcción:	2019	Temp. interior invierno [°C]:	20,0	Temp. interior verano [°C]:	25,0
Nr. de viviendas	1	Ganancias internas de calor (GIC); caso calefacción [W/m²]:	2,4	GIC caso refrig. [W/m²]:	2,4
Nr. de personas:	2,9	Capacidad específica [Wh/K por m² de SRE]:	84	Refrigeración mecánica:	

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

					Criterio	Criterios alternativos	¿Cumplido?[2]
	Superficie de referencia energética	m²	152,4				
Calefacción	Demanda de calefacción	kWh/(m²a)	13	≤	15	-	Sí
	Carga de calefacción	W/m²	9	≤	-	10	
Refrigeración	Demanda refrigeración & deshum.	kWh/(m²a)	-	≤	-	-	-
	Carga de refrigeración	W/m²	-	≤	-	-	
	Frecuencia de sobrecalentamiento (> 25 °C)	%	5	≤	10		Sí
	Frecuencia excesivamente alta humedad (> 12 g/kg)	%	0	≤	20		Sí
Hermeticidad	Resultado ensayo presión n_{50}	1/h	0,5	≤	0,6		Sí
Energía Primaria no renovable (EP)	Demanda EP	kWh/(m²a)	53	≤	-		-
Energía Primaria Renovable (PER)	Demanda PER	kWh/(m²a)	32	≤	60	60	Sí
	Generación de Energía Renovable (en relación con área de la huella del edificio proyectado)	kWh/(m²a)	0	≥	-	-	

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

Energy balance heating



Energy balance cooling