

## Object Documentation Passivehouse/Passivhaus

Single family house in F - 59960 Neuville en Ferrain (North of France)

Database ID: 2415 / PassivHaus (Certificate-ID : 4510\_LPF\_PH\_20120613\_EV)

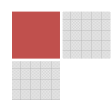


Responsible Person for planning: Vincent DELSINNE Architect / [www.delsinnearchitecte.fr](http://www.delsinnearchitecte.fr)

This house has been built for a single family nearby the city of Lille, North of France. It's a wooden single storey house with a wooden basement on a perfect North South orientation. The House has been built in 2011 and has been used since then with high satisfaction.

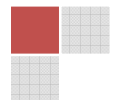
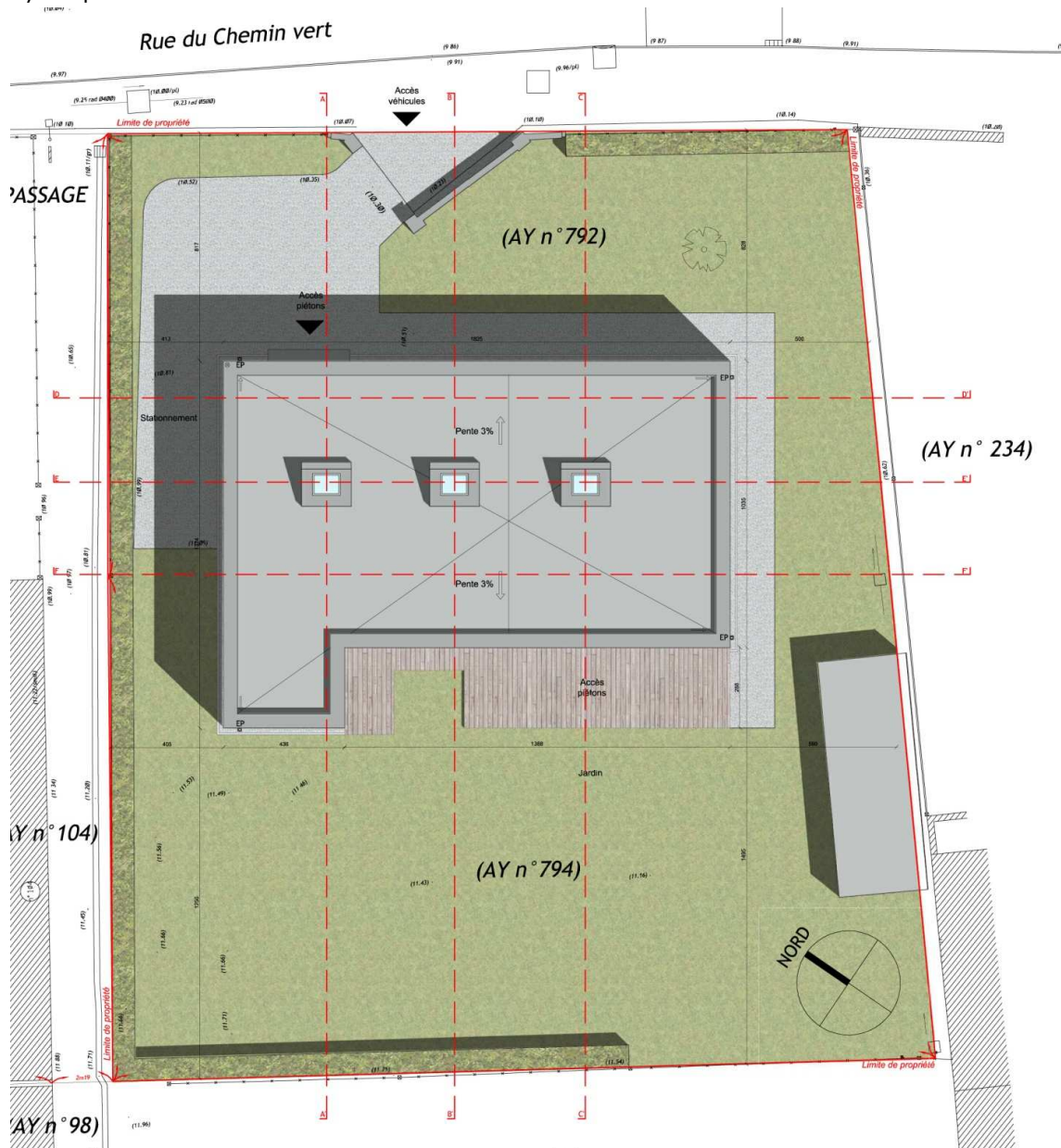
Particularity : Heat Pump for hot water and heat pump for heating, Rain water collectors

U Value exterior wall	0,11 W/(m <sup>2</sup> K)	PHPP annual-	15 kWh/(m <sup>2</sup> a)
U Value basement	0,106 W/(m <sup>2</sup> K)	heat demand	
U Value roof	0,083 W/(m <sup>2</sup> K)	PHPP	
U Value window	0,85 W/(m <sup>2</sup> K)	Primary-energy	90 kWh/(m <sup>2</sup> a)
Heat recovery efficiency of ventilation : 94%		Pressure test n50	0,44 h-1



## Site plan

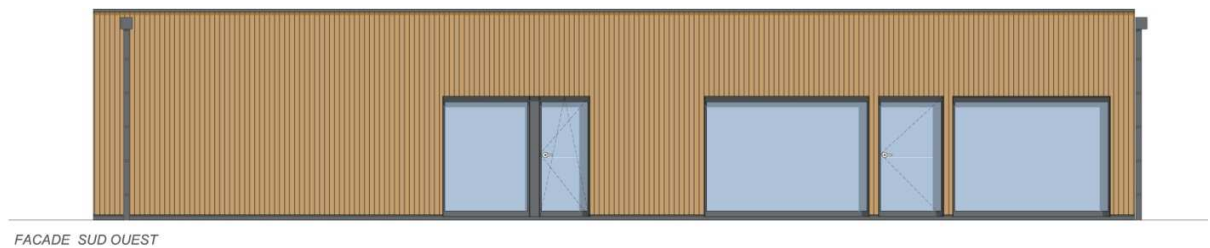
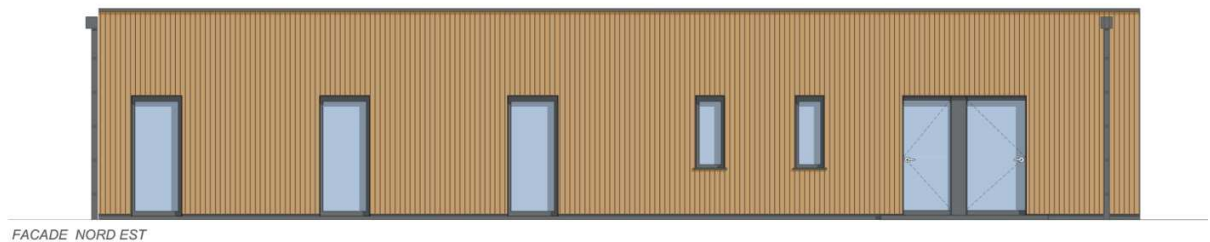
Site is located at Neuville en Ferrain in France, region Nord Pas de Calais. The project is a single storey house. It has an area of 167m<sup>2</sup> (SRE - Energy reference area). It is located in the northeast of the plot and it is oriented to the South / Southwest. The building is a compact rectangular volume that opens wide to the garden. The living extend outwardly through the long terrace. The entry of pedestrians and vehicles is located in the North East.



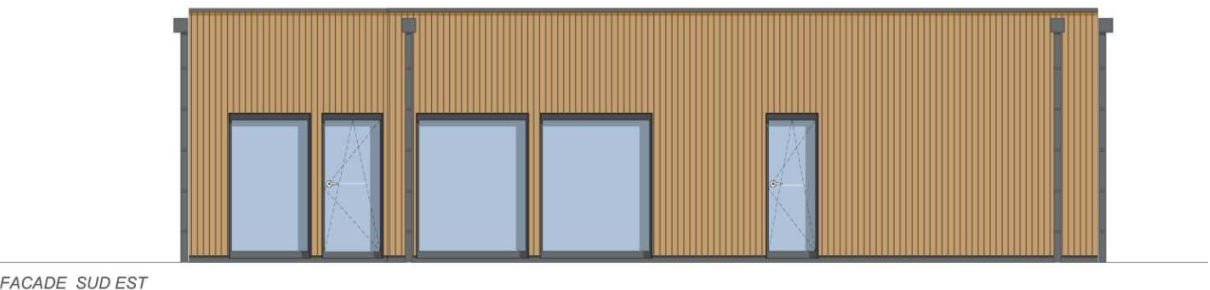
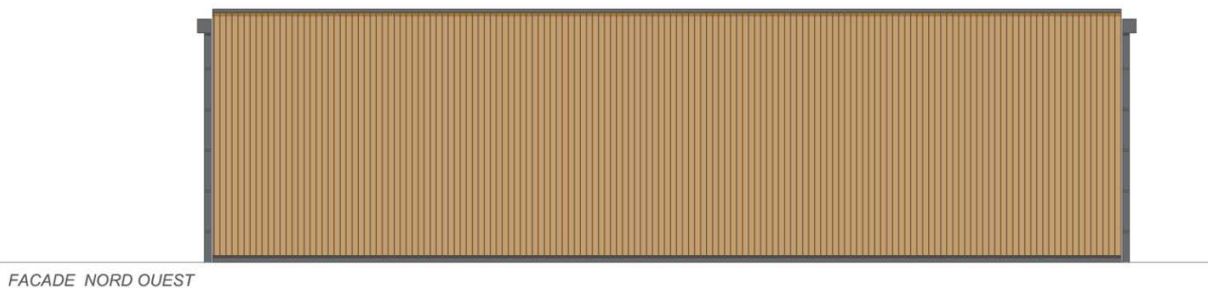
## Elevations

On North elevation are placed closed spaces such as workshop, equipment room, laundry, and at the end the parents room which looks onto the exterior South West terrace.

South and West elevations, where the living room and the kitchen are, have a large view on the garden. The natural light resource is generous. Natural lighting has been optimized for each room. The aim is to bring the highest comfort to users while reducing drastically the energy consumption of lighting devices.

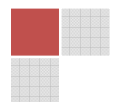


## Facades North East and South West



## North West and South West facades

*Atelier d'Architecture DELSINNE / Passivhaus in Neuville en Ferrain*



## Photographs



Entrance



View from garden



View on terrace



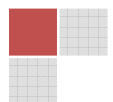
Entrance



Central corridor



Living room

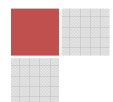
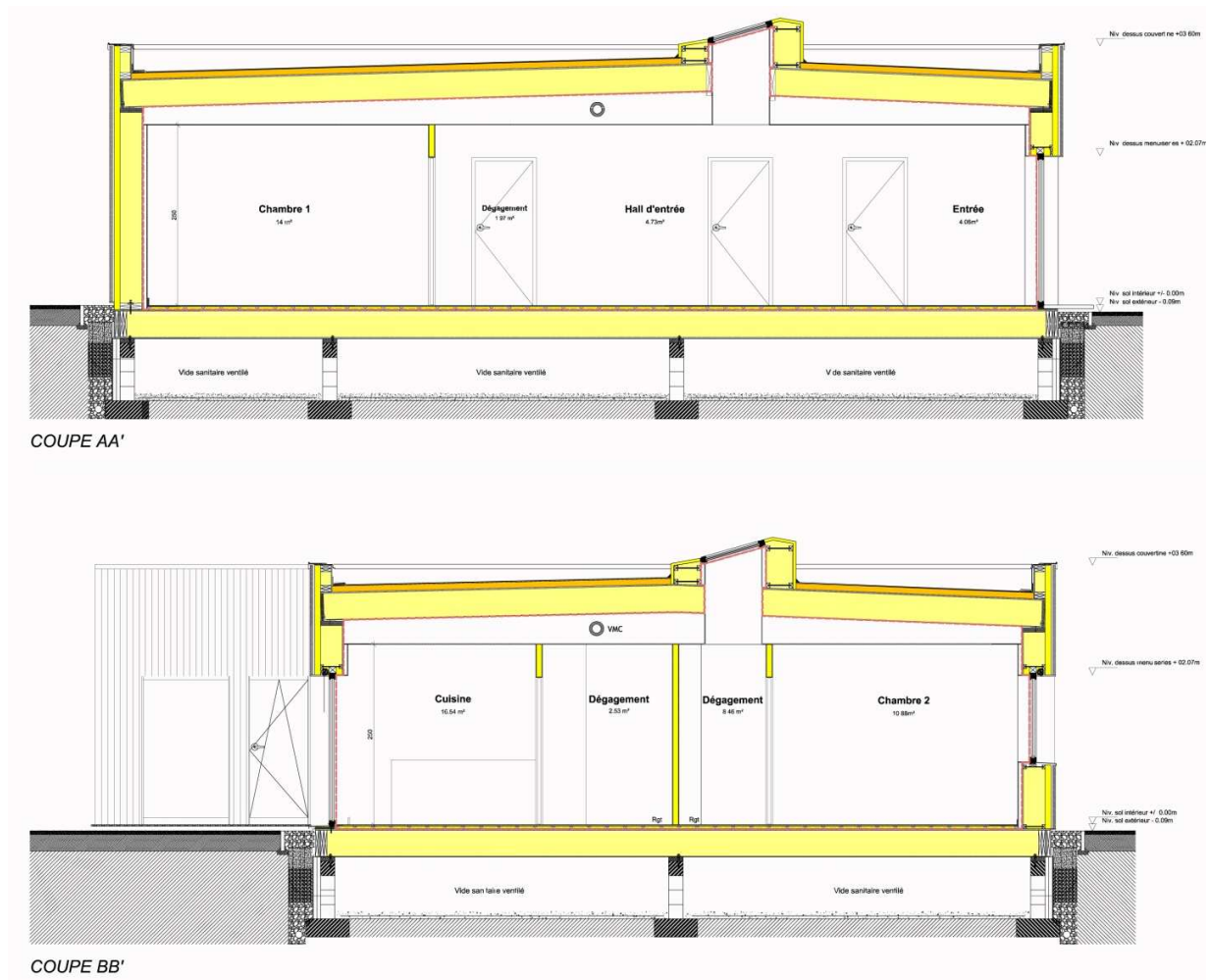


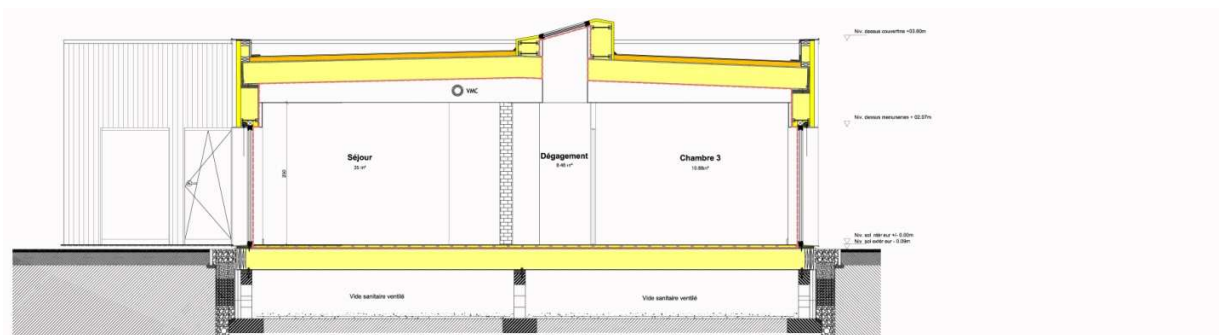


## Sections

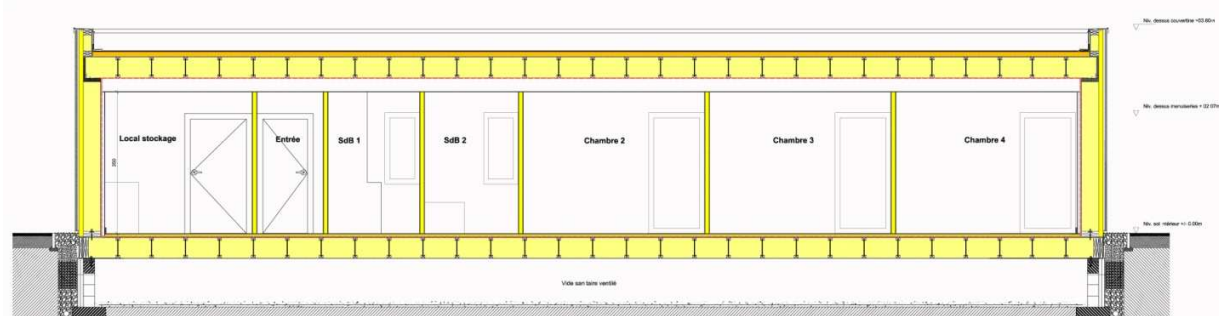
All sections of the building shows the continuity of the air barrier and the insulation in the various walls. The isolation of tissue and wood fiber is indicated by the yellow color.

The building rests on foundations that release an accessible crawlspace. The crawlspace can ventilate the underside of the building

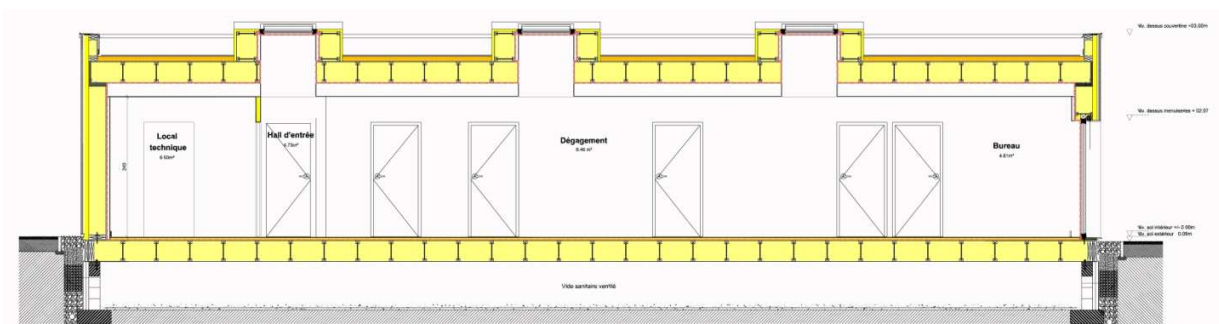




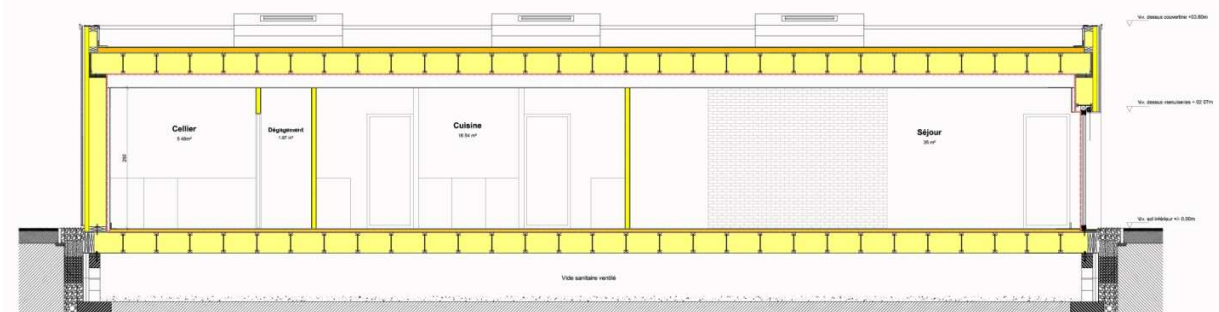
COUPE CC'



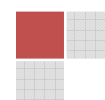
COUPE DD'



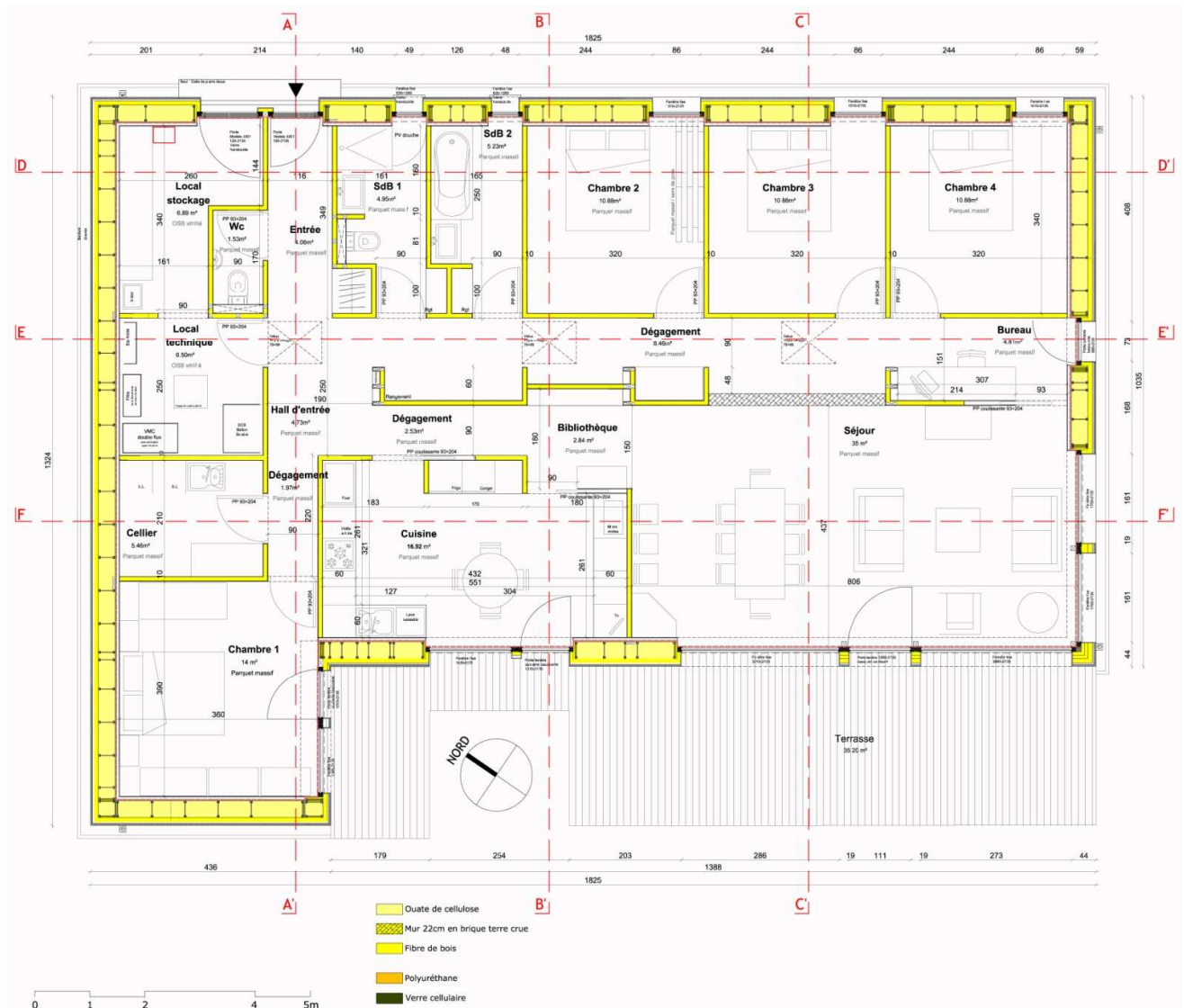
COUPE EE'



COUPE FF'

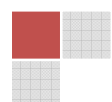


## Floor Plan



The building is a single-storey house. Spaces have been designed to favour living rooms in a compact volume.

The entrance placed on the East facade gives access to a hall which leads to the different parts of the house. On the East side a series of adjoining rooms comprises two bathrooms and three children rooms. These adjoining rooms are separated from the living room and the kitchen by a long corridor which leads to storage spaces and finally to an office room. In order to increase the thermal mass of the house, an interior wall made of mud bricks separates the living room and the central corridor.



## Construction details

The house is based on a ventilated crawl space. Prefabrication of the wooden structure enabled to leave the building site clean and gain time in the assembling process. The various building assemblies compose an excellent thermal envelope.

The main insulating material is cellulose wadding. It is blown up between wood panels which form the floor, the external walls and the roof. Wood fiber is used as both rain screen and additional insulation around exterior windows.

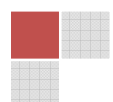


Model of the wood beams structure

## Insulation

Insulation used for the project are cotton cellulose blown into the walls (wall, floor, roof), wood fiber exterior wood walls complement, as well as all interior partitions.

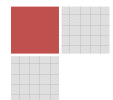
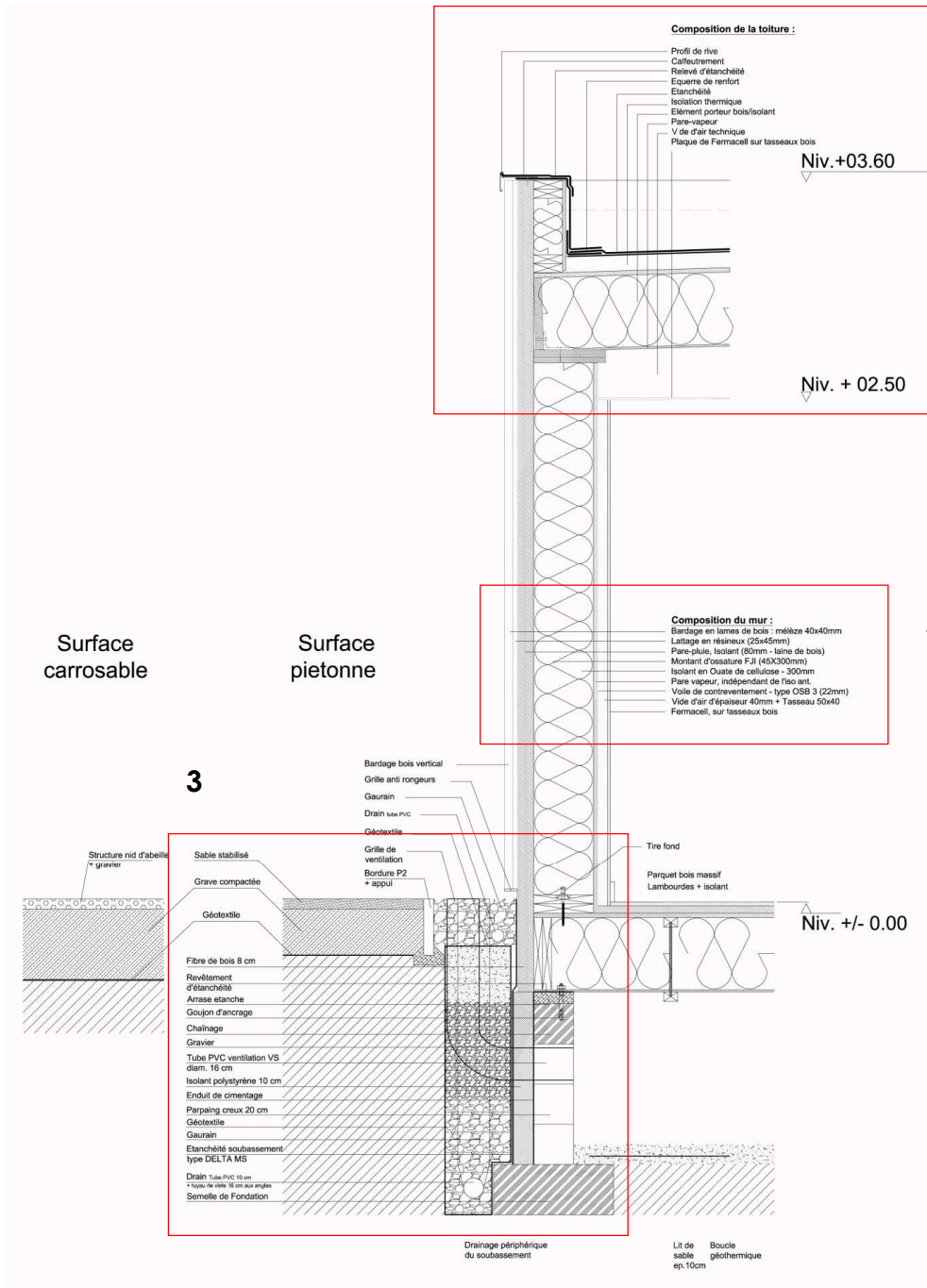
Thickness of cotton cellulose : Wall 360mm / Floor 360mm / Roof 360mm





## Details

This section details the connections between the floor and the wooden structure of the building. A drainage system has been implemented around the building foundation to direct water from the groundwater near.



## Details description

### 1. Composition de la toiture :

Profil de rive  
Calfeutrement  
Relevé d'étanchéité  
Equerre de renfort  
Etanchéité  
Isolation thermique  
Elément porteur bois/isolant  
Pare-vapeur  
Vide d'air technique  
Plaque de Fermacell sur tasseaux bois

### 2. Composition du mur :

Bardage en lames de bois : mélèze 40x40mm  
Lattage en résineux (25x45mm)  
Pare-pluie, Isolant (80mm - laine de bois)  
Montant d'ossature FJI (45X300mm)  
Isolant en Ouate de cellulose - 300mm  
Pare vapeur, indépendant de l'isolant.  
Voile de contreventement - type OSB 3 (22mm)  
Vide d'air d'épaisseur 40mm + Tasseau 50x40  
Fermacell, sur tasseaux bois

### 1. Composition Roofing:

Edge profile  
Tightening  
Statement sealing  
Reinforcement bracket  
Sealing  
thermal insulation  
Wood holder / insulator element  
Vapour Retarder / INTELLO  
Technical empty air  
Fermacell plate on wood battens

### 2. Wall composition:

Siding blades wood larch 40x40mm  
Softwood battens (25x45mm)  
Rainscreen, Insulation (80mm - excelsior)  
Amount framing FJI (45X300mm)  
Cellulose wadding insulation - 300mm  
Vapor barrier, independent of the insulation.  
Sailing bracing - OSB 3 (22mm) Type  
Vacuum 40mm épaisseur + Cleat 50x40  
Fermacell, wood battens

### 3. Composition du soubassement :

Fibre de bois 8 cm  
Revêtement d'étanchéité  
Arase étanche  
Goujon d'ancrage  
Chaînage  
Gravier  
Tube PVC ventilation VS  
diam. 16 cm  
Isolant polystyrène 10 cm  
Enduit de cimentage  
Parpaing creux 20 cm  
Géotextile  
Gaurain  
Etanchéité soubassement  
Drain  
Semelle de Fondation

### 4. Composition du plancher:

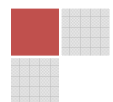
Parquet bois massif - 20 mm  
Solivage bois / Fibre de bois - 35 mm  
Etanchéité à l'air  
OSB 3 - 22 mm  
Structure bois  
Isolant / Ouate de cellulose - 360 mm  
OSB - 10 mm  
Vide sanitaire ventilé

### 3. Composition of the base:

Woodgrain 8 cm  
Seal coating  
Arrase waterproof  
Anchoring bolt  
gravel  
PVC tube ventilation VS  
Polystyrene insulation 10 cm  
Coated cementing  
Cinderblock hollow 20 cm  
Geotextile  
Gaurain  
Waterproofing basement  
Foundation

### 4. Composition of the floor:

Solid wood parquet - 20 mm  
Wood joist / Woodgrain - 35 mm  
Airtightness  
OSB 3-22 mm  
wood stucture  
Insulation / Cellulose wadding - 360 mm  
OSB - 10 mm  
Ventilated crawl space

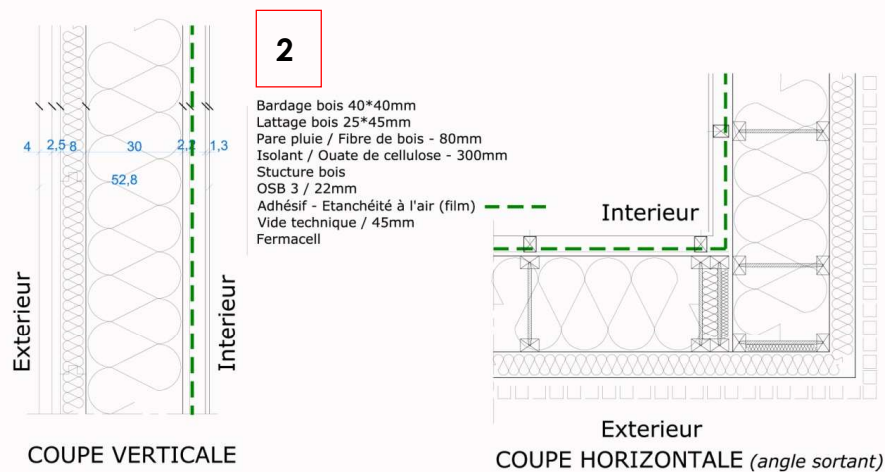


## Composition of the structure

This set of details of the wood structure show the composition of the peripheral walls, floor, roof and a corner junction. The composition of the various walls are close. In the wall thickness is found batting and blown cellulose outside a wood fiber which serves as rain barrier.

U Value exterior wall	0,11 W/(m²K)
U Value basement	0,106 W/(m²K)
U Value roof	0,083 W/(m²K)

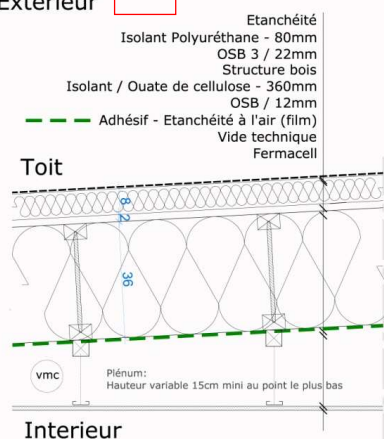
### Détails de principe murs périphérique -



### Détails de principe Toiture et plancher

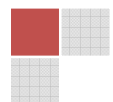
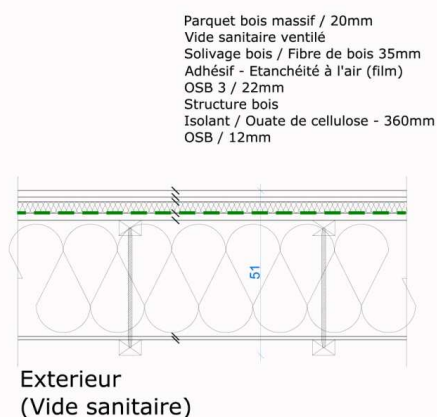
#### Toiture Exterieur

**1**

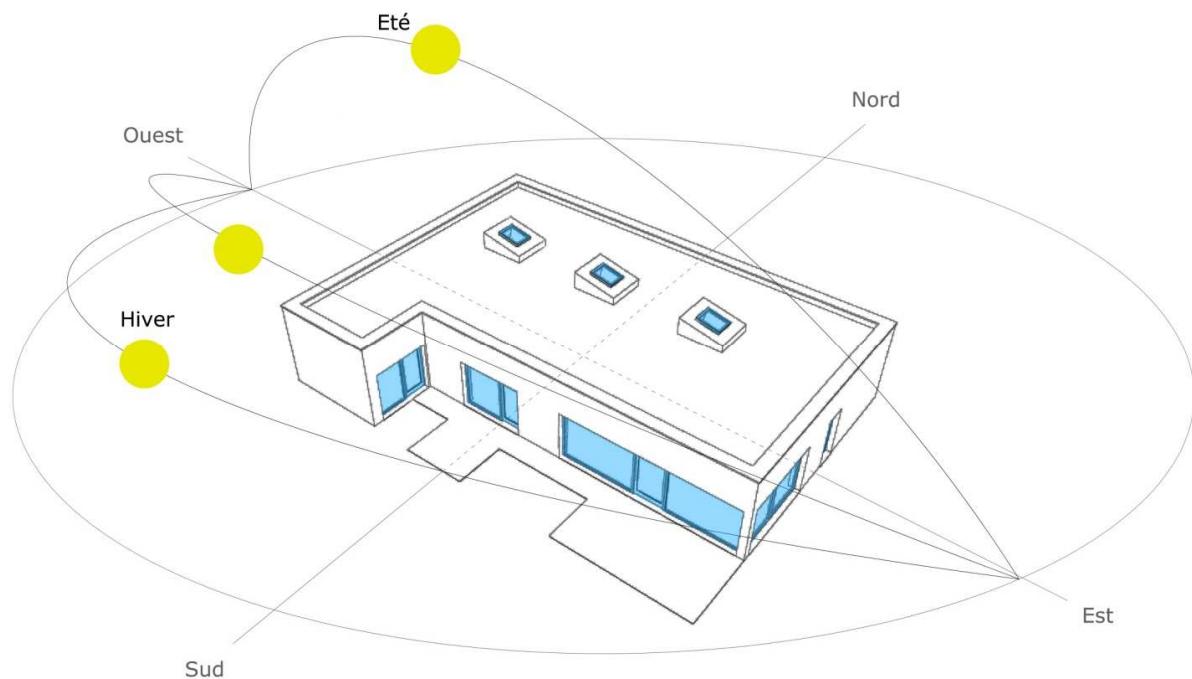


#### Plancher Interieur

**4**



## Windows

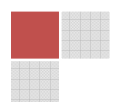


Windows with triple certified type OPTIWIN ALU2Holz units were placed on the North East, South West and South East facades. These windows are wood with a hood outdoors lacquered aluminum. U Value window :  $0,85 \text{ W/(m}^2\text{K)}$

Roof windows Velux type have been placed on the flat roof facing east. Isolated curbs composed as peripheral walls were made to accommodate the three skylights.

The characteristics of the glass used were as follows :

Interpane iplus 3<sup>E</sup> et Interpane iplus 3LS - 442/16Ar90/4/16Ar90/4





**Windows** : Uf-values, Ug-values and g-values

## Conception passive VITRAGE SUIVANT CERTIFICAT

[pour aller aux murs rideaux / châssis à partir de la ligne 99](#)

N° de liste	TYPE Vitrage	Facteur solaire (valeur g)	Valeur U <sub>g</sub> du vitrage W/(m²K)
1			
2	Vitrage Velux 4/10Kr/4/10Kr/4	0,460	0,549
3	Interpane iplus 3E 442/16Ar90/4/16Ar90/4	0,450	0,580
4	Interpane iplus 3LS 442/16Ar90/4/16Ar90/4	0,560	0,749
5			

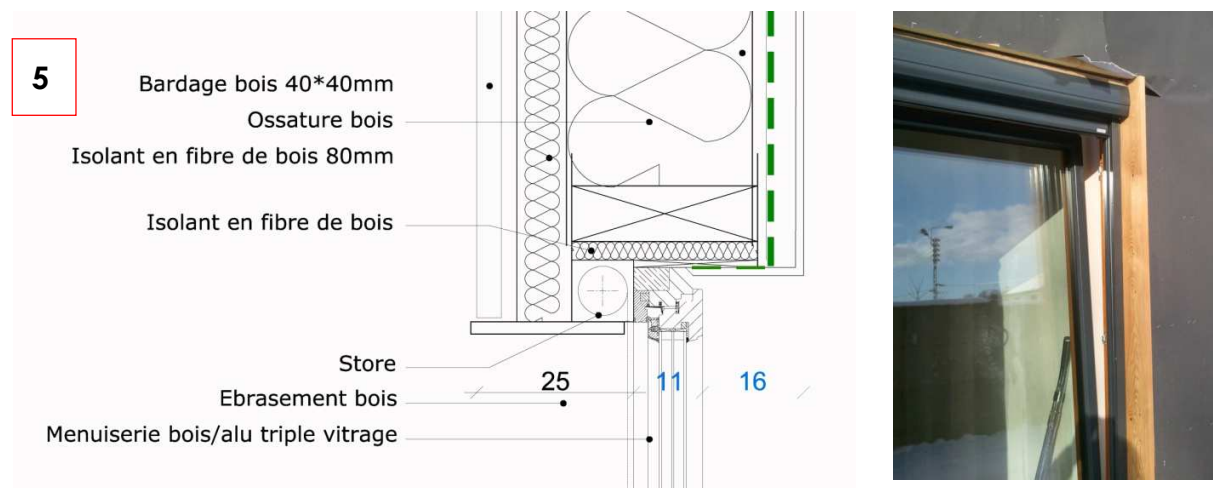
## MURS RIDEAUX/CHASSIS CERTIFIÉS

[pour aller aux vitrages à partir de la ligne 2](#)

N° de liste	TYPE	Valeur U <sub>f</sub>	Dimension châssis				Ponts thermi	
	Châssis	Châssis	Largeur gauche	Largeur droite	Largeur en bas	Largeur en haut	Ψ <sub>intercalaire</sub>	Ψ <sub>mise en oeuvre</sub>
	Façade mur rideau	Mur rideau	demie largeur montant	demie largeur montant	demie largeur traverse	demie largeur traverse	Ψ <sub>intercalaire</sub>	Ψ <sub>mise en oeuvre</sub>
		W/(m²K)	m	m	m	m	W/(mK)	W/(mK)
1	Châssis Velux	1,00	0,11	0,11	0,14	0,11	0,04	0,10
2	OPTIWIN Alu2Holz 1 Vantail Volet Roulant	0,95	0,12	0,12	0,11	0,12	0,03	0,04
3	OPTIWIN Alu2Holz 2 Vantaux Volet Roulant	0,95	0,12	0,06	0,12	0,12	0,03	0,04

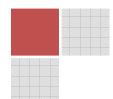
**Summer comfort** : external blinds are integrated into the wooden frame.

Integrated blinds are installed in the wall for windows facades South / South West and South East with manual opératon.



5. Wood siding 40 \* 40 / Frame / Wood fiber insulation 80mm wood / wood fiber insulation / blinds / ebrasement wood / carpentry wood / aluminum triple glazed

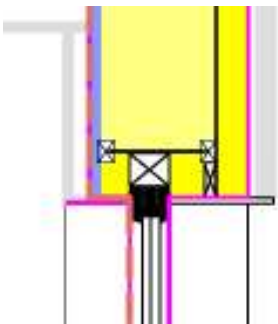
Atelier d'Architecture DELSINNE / Passivhaus in Neuville en Ferrain



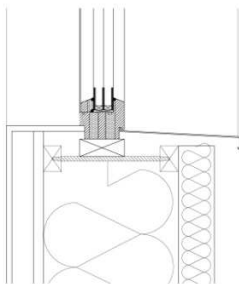
## Window integration

These details show the integration of windows in the walls. External windows are installed with a pre framework OSB. In South and West facade, external blinds are integrated into the wooden frame. They help maintain summer comfort. There are no external blinds on the facade East. There is insulation : Wood fiber.

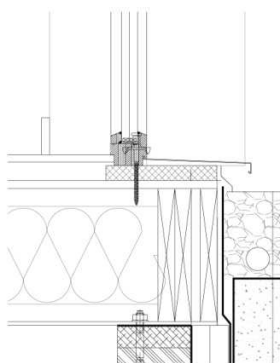
East facades without blind



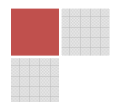
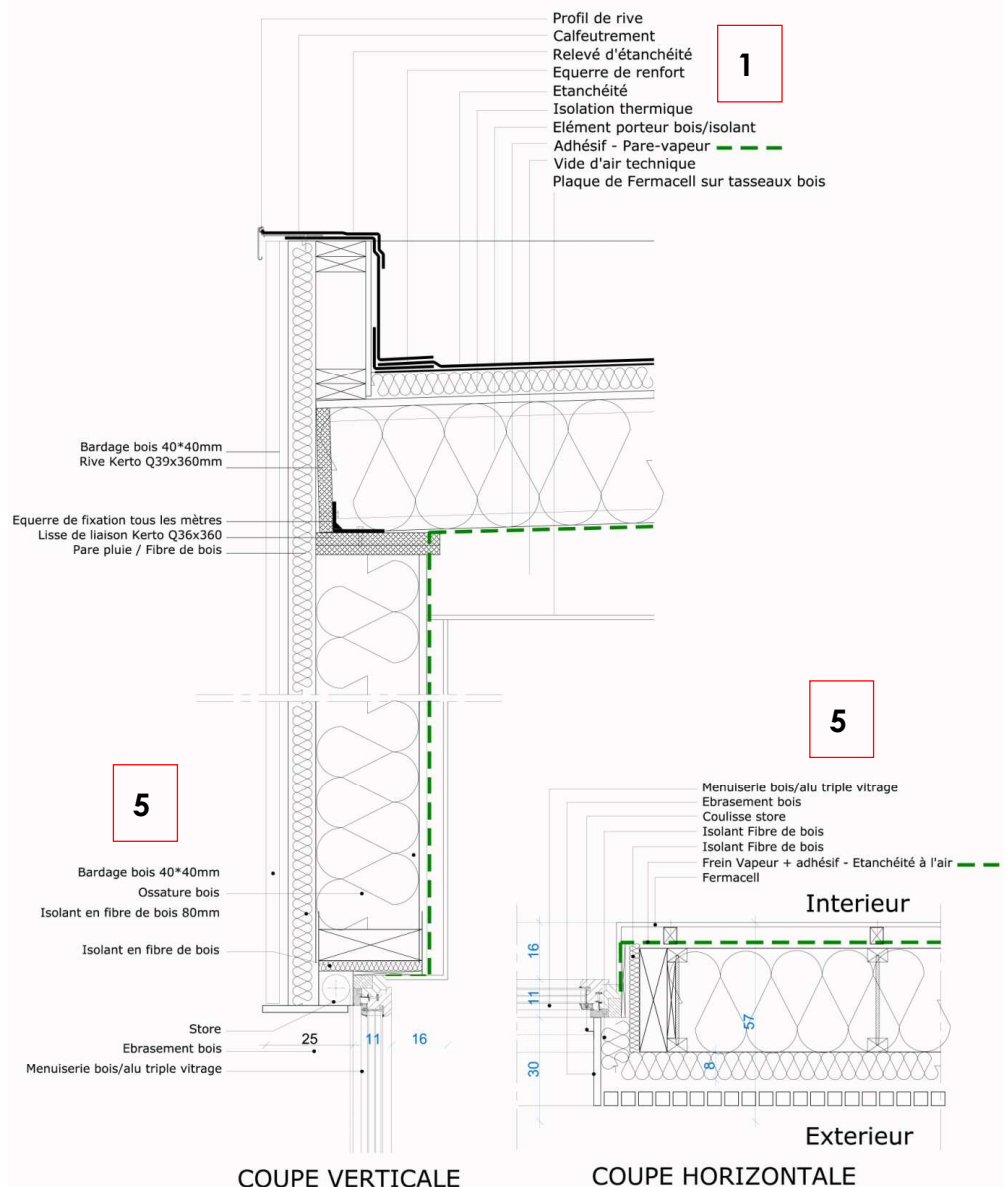
Bottom of window on allegé



Bottom of window on the floor



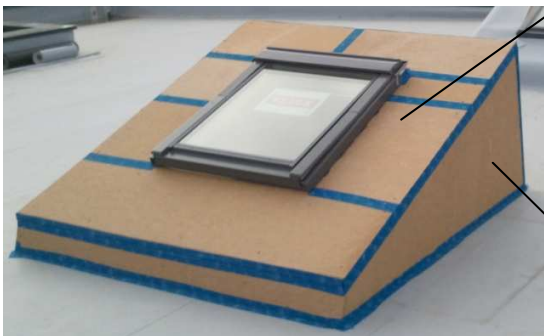
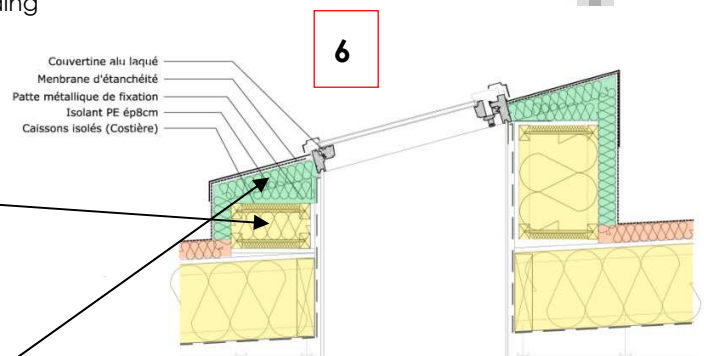
## Détails de principe murs/menuiserie



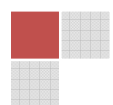
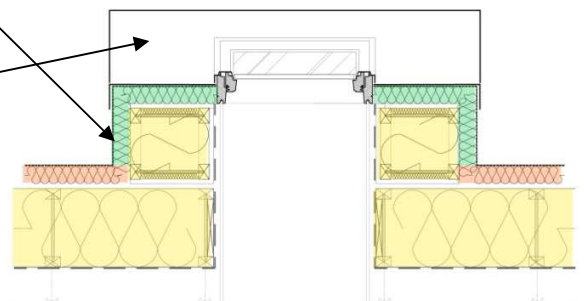
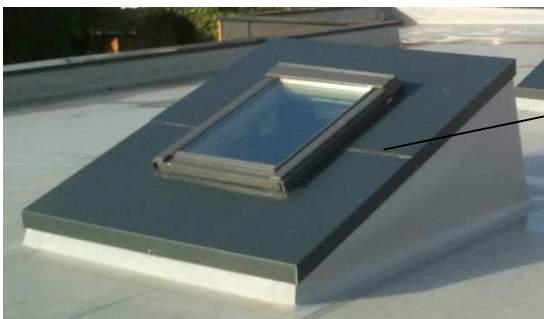
## Skylight integration

These details and photo showing the integration in roof windows. Costieres of wood filled with insulation in cellulose were performed in order not to create a thermal bridge between the roof and the window. There remains a thermal bridge right to the integration of the skylight. A layer of wood fiber insulation full top thereof. These windows create natural ventilation for summer comfort.

6. Couvertine lacquered aluminum / waterproofing membrane / metal support bracket velux / insulation 8cm / Case isolated cellulose wadding



- Cellulose wadding
- Wood fiber
- PE insulation



## Airtightness strategy

The airtightness is ensured by OSB disposed inside the building on the peripheral walls and the floor. A membrane vapor barrier Egghead guy from Proclima is used for the ceiling. To ensure a continuous and proper bonding of the adhesive in Proclima Tescon type is used for the connections of the panels and membranes.

For this building three tests were performed. Two intermediate and final test for the certification of the building.

Flow control in each room was created at the end of construction.

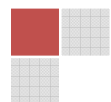


Airtightness

FEUILLE EXIGEE pour les systèmes de ventilation des habitations: MISE EN SERVICE																
VMC à récupération de chaleur																
Projet					Mise en service					Ventilation						
Objet					Entreprise					Constructeur						
Chantier: rue, n°					Clément CASTEL / Alexandre PEO					Produit/Modèle						
Chantier Code postal, lieu					6 rue Marcel Dassault					N° Appel						
Maître d'ouvrage nom:					59113 Haellin					N° Contrôle						
Maître d'ouvrage téléphone					0320524410											
Année de construction					2010											
1. Protocole des quantités d'air air neuf/air extrait																
N°	Description de la pièce	Conception			Mesure 1		Mesure 2		Mesure 3		Type de bouche	Réglage	Surpression V <sub>h</sub> Mesure m/s	Mesure bruit dB(A)	Type de filtre	Filtre propriété
		V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s							
1	Cuisine		50			93,5									qual / norm	
2	SDB 1 + WC		35			40									qual / norm	
3	SDB 2		25			26,4									qual / norm	
4	WC		30			33,6									qual / norm	
5	Salon 1	40			35										qual / norm	
6	Salon 2	40			44										qual / norm	
7	Chambre 1	40			40										qual / norm	
8	Chambre 2	20			33										qual / norm	
9	Chambre 3	20			25										qual / norm	
10	Chambre 4	20			23										qual / norm	
11	Cellier		30			17									qual / norm	
12	Atelier		20			30,2									qual / norm	
13															qual / norm	
14															qual / norm	
15															qual / norm	
16															qual / norm	
17															qual / norm	
18															qual / norm	
19															qual / norm	
20															qual / norm	
	total	180,00	180,00	---	320,2	205,7										
2. Balance des volumes																
N°	Description de la pièce	Mesure 1			Mesure 2			Mesure 3			Déséquilibre	Type de réglage	Calibrage	Mesure bruit dB(A)	Classe filtration	Filtre propriété
		V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s	V <sub>ext</sub> m³/s						
1	Aspiration air extérieur														qual / norm	
2	Extraction air vicié														qual / norm	



Flow control

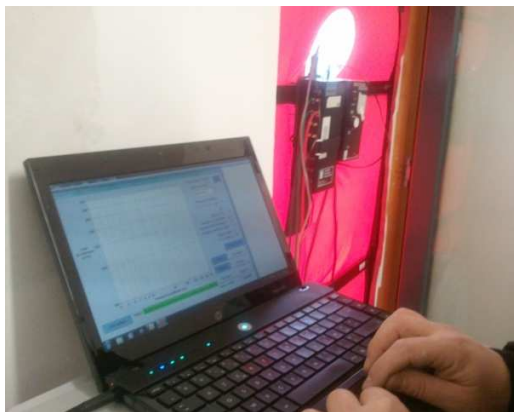




## Air test result (Test final du 11/12/2010)

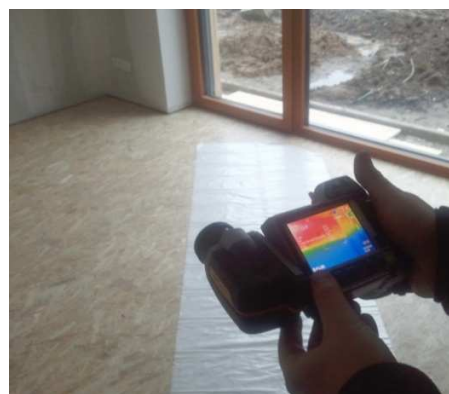
Outside Building volume: 682m3

	DEPRESSURISATION			PRESSURISATION		
	Valeurs	Intervalle de confiance		Valeurs	Intervalle de confiance	
		Mini	Maxi		Mini	Maxi
$C_L$ (m <sup>3</sup> /(h.Pa <sup>n</sup> ))	10,57	8,82	12,66	9,54	8,20	11,09
$C_{env}$ (m <sup>3</sup> /(h.Pa <sup>n</sup> ))	10,42	8,70	12,49	9,48	8,15	11,02
Exposant n	0,73	0,67	0,78	0,76	0,72	0,80
Coefficient de corrélation r	0,9959	-	-	0,9974	-	-
<b>Q<sub>4 Pa-surf</sub></b> (m <sup>3</sup> /(h.m <sup>2</sup> ))	<b>0,09</b>	0,08	0,10	<b>0,09</b>	0,08	0,09
$V_4$ (m <sup>3</sup> /h)	28,89	25,76	32,02	27,34	24,85	29,82
$n_{50}$ (h <sup>-1</sup> )	0,43	0,41	0,45	0,45	0,43	0,46
$V_{50}$ (m <sup>3</sup> /h)	180,45	173,03	187,87	186,09	179,58	192,60

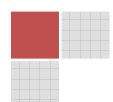


Blower door

## Thermography



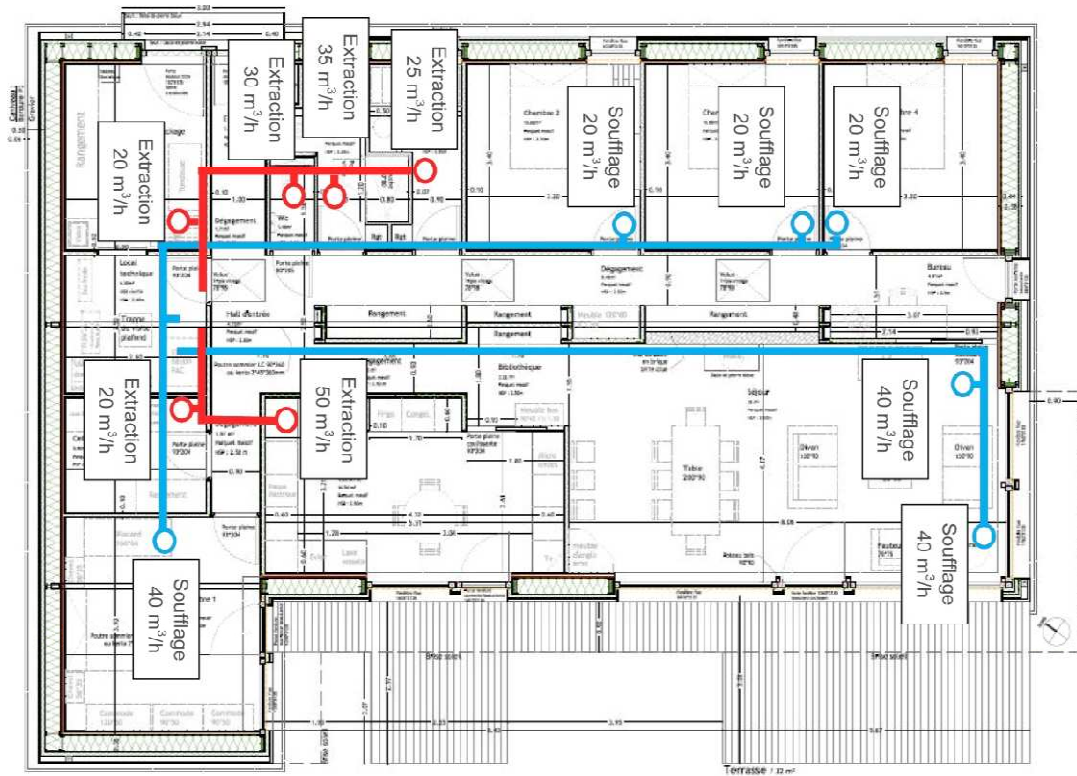
Atelier d'Architecture DELSINNE / Passivhaus in Neuville en Ferrain



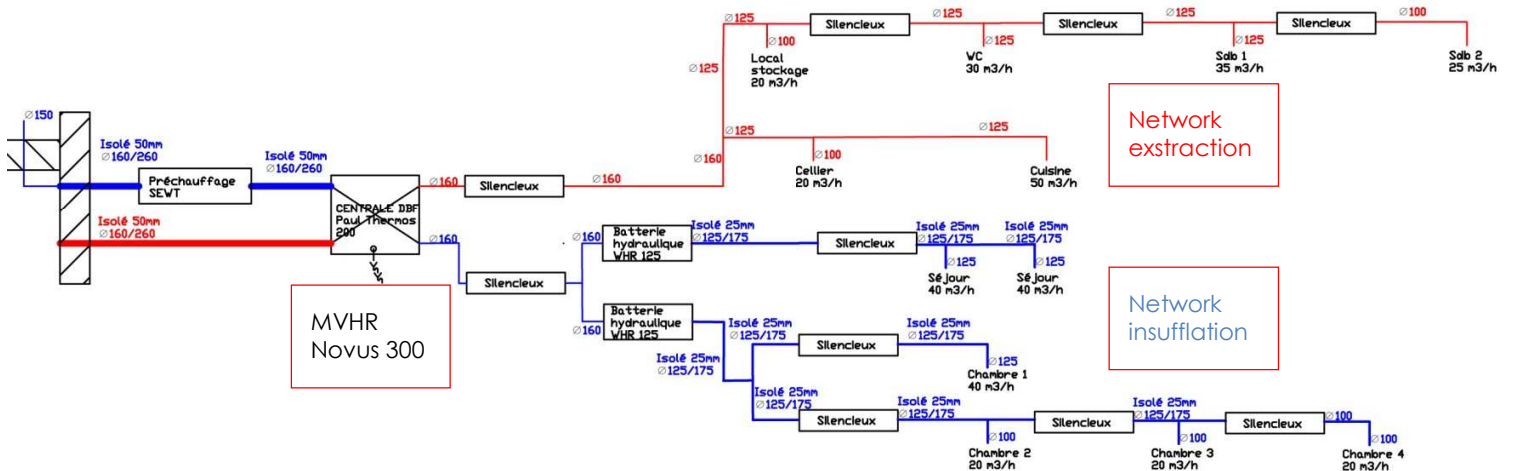
## Ventilation plan for the ductwork

Blue Line : Network insufflation

Red line : Network extraction



— Air Neuf  
— Air Vicié



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## **Ventilation strategy**

Heat recovery efficiency of ventilation : 94%

Electrical efficiency : 0,24 Wh/m³

The effective heat recovery rate : 88,70%

## **Energy**

### **Winter conditions**

The MVHR Novus 300 DC by PAUL is coupled to a soil brine heat exchanger (PAUL SD250/500).

Before reaching the heat exchanger of the air treatment unit, outdoor air is preheated by the soil brine heat exchanger. Here instead of an air duct the exchanger is composed of a soft tube filled with brine in order to prevent frost.

The exchanger transfers then heat from the brine to the incoming outdoor air. Such a soil heat exchanger has been chosen because it is more hygienic than soil air heat exchanger (no risk of bacteria growth) and easier to install.

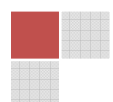
However control must be sensitive enough to spare the heat stock of the ground and mitigate the electricity consumption of the circulation pump.

The ventilation unit runs all the time at a minimal rate. A control panel in the equipment room can increase momentarily the airflow when necessary. The kitchen is equipped with a recycling hood as well as an extract air vent integrating a filter.



View of the equipment room

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## Summer conditions

The soil heat exchanger provides pre-cooling of the outdoor air in summer. Different solutions prevent overheating in summer. Exterior blinds made of micro perforated screen provide sun shading on the South, West and East facades.

Indoor temperature is reduced during the night by natural ventilation through skylights on the roof, one of which is operated automatically with a motor. The soil heat exchanger helps also cooling down the incoming outside air in summer.

The MVHR Novus 300 DC by PAUL is coupled to a soil brine heat exchanger (PAUL SD250/500).

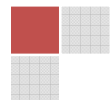
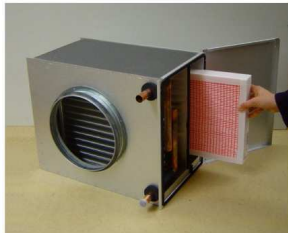
Network ventilation  
PAUL Octopus system



## Preheating

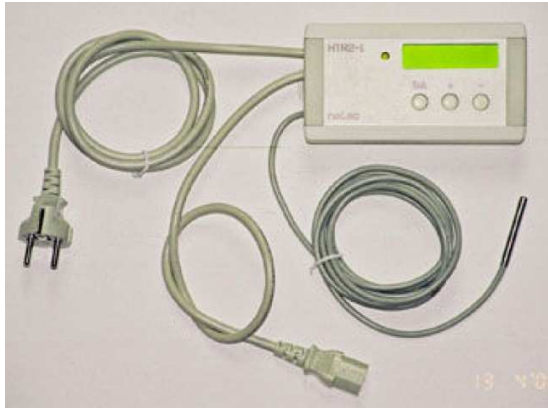
System Netec CWK 250 iso-F  
(insulated case + filters)

Pump and security group Netec PGR  
1-40

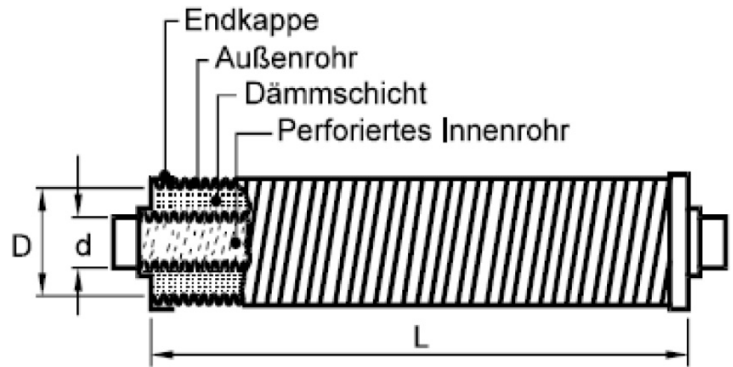




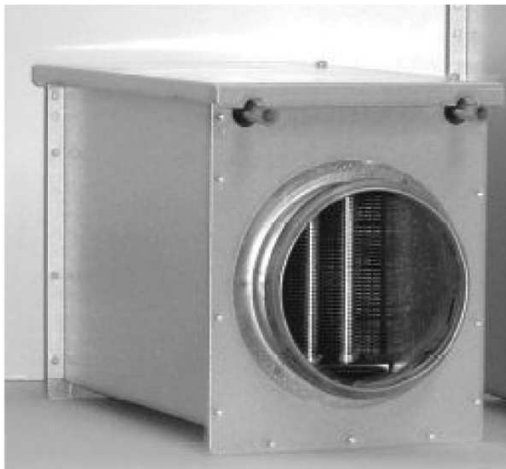
Control system Netec HTR 2-1



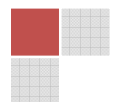
PAUL silent. Diameters 125 and 160



Hydraulic batteries Netec LHR-160



Valves readings direct debits / Type Taccnova AV23 SETTER



## Heating strategy

Production of heating and hot water is provided by a heat pump mini Europa Mini EWP at Ochsner, coupled ç ball 500 liters Hydrocube 544/19/0 home Rotex.

## Domestic Hot Water

Heating and Domestic hot water are delivered by a micro geothermal water/water heat pump, a mini EWP from Ochsner.

Unlike air-based heat pumps, this water-based system provides a fairly constant efficiency throughout winter as the source temperature from the ground does not vary much.

## Heat pump

Europe model Mini EWP at Ochsner



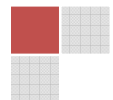
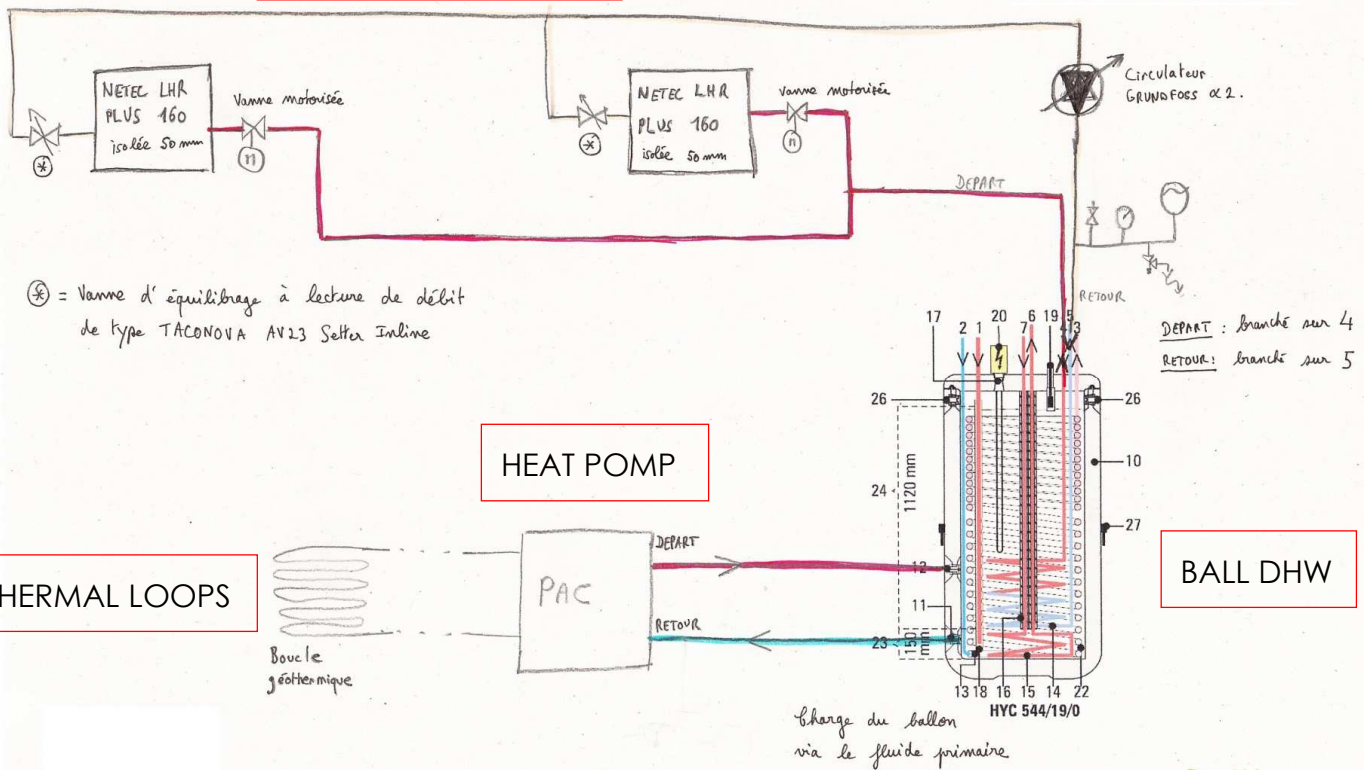
## Ball DHW

Model Hydricube 544/19/0 home Rotex



## Technical installation diagram / Heating and DHW

### HYDRAULIC BATTERIES



## Geothermal loops

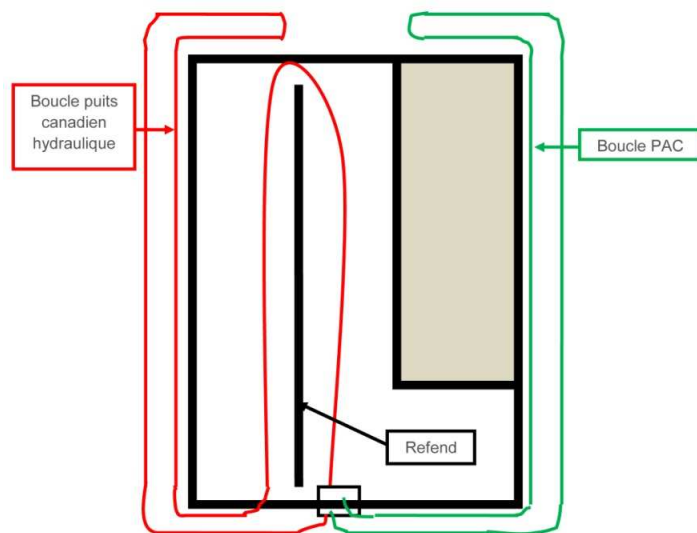
Two geothermal loops were buried two meters deep around the building.

For a double flow ventilation and a second for the heat pump.

One breakthrough in the floor to switch all networks required to operate the building, and two geothermal loops.

Exchanger geothermal brine

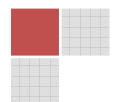
SD 250/500 model – PAUL



**Red line:** Geothermal Loop for comfort ventilation

**Green line:** Geothermal loop for the heat pump

**Black line:** Building Foundations



## Vérification

Projet:	Cornard		
Localité et zone climatique:	F - Lille		
Adresse:	Neuville En Ferrain		
Code postal / localité:	59960		
Pays:	France		
Type de bâtiment:	Maison individuelle		
Maître de l'ouvrage:	Mr Mme Cornard		
Adresse:			
Code postal / localité:	Neuville en Ferrain		
Architecte:	Vincent Delsinne architecture		
Adresse:			
Code postal / localité:	59000 Lille		
Bureau d'étude fluides / techniques spéciales:	Energelio		
Adresse:	6, rue Marcel Dassautl		
Code postal / localité:	59113 Seclin		
Année de construction:	2011		
Nombre de logements:	1	Température intérieure:	20,0 °C
Volume extérieur du bâtiment $V_e$ :	682,3 m <sup>3</sup>	Apports internes:	2,1 W/m <sup>2</sup>
Nombre d'occupants:	4,8		

Valeurs rapportées à la surface de référence énergétique				
Surface de référence énergétique $A_{RE}$ :	166,6 m <sup>2</sup>			
	Méthode utilisée:	Méthode mensuelle	Certification standard passif:	Critères respectés ?
<b>Besoin de chaleur de chauffage annuel:</b>	15 kWh/(m <sup>2</sup> a)		15 kWh/(m <sup>2</sup> a)	oui
<b>Résultat du test d'infiltrométrie:</b>	0,4 h <sup>-1</sup>		0,6 h <sup>-1</sup>	oui
<b>Besoin en énergie primaire</b> (ECS, chauffage, refroidissement, électricité auxiliaire et domestique):	90 kWh/(m <sup>2</sup> a)		120 kWh/(m <sup>2</sup> a)	oui
<b>Besoin en énergie primaire</b> (ECS, chauffage et électricité auxiliaire):	41 kWh/(m <sup>2</sup> a)			
<b>Besoin en énergie primaire</b> économisée par la production d'électricité photovoltaïque:	kWh/(m <sup>2</sup> a)			
<b>Puissance de chauffage:</b>	11 W/m <sup>2</sup>			
<b>Surchauffe estivale:</b>	9 %	sup. à 25 °C		
<b>Besoin de refroidissement annuel:</b>	kWh/(m <sup>2</sup> a)		15 kWh/(m <sup>2</sup> a)	
<b>Puissance de refroidissement:</b>	5 W/m <sup>2</sup>			

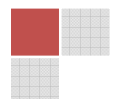
Le soussigné déclare que les résultats ci-dessus ont été fournis et calculés suivant la méthode de calcul PHPP sur base des caractéristiques de l'immeuble. La note de calcul avec PHPP est fournie en annexe.

Date:

12.06.12

Signature:

LaMPS





## Construction cost

Cost of building: 333.392,18 € TTC

Cost per m<sup>2</sup>: 1.996,36 € TTC

SRE 167 m<sup>2</sup> (Energy reference area)

## Year of construction

Beginning of construction / March 2010

End of construction / December 2010

## References

TELEVISION France / France House 5 / Sequence AGIR

[/www.youtube.com/watch?v=6jFnv3C592k](http://www.youtube.com/watch?v=6jFnv3C592k)

Newspaper article / Act Ecolo / Nord Eclair

Newspaper article / Test blower / Nord Eclair

Newspaper article / A Labelled house / Nord Eclair

Article internet / Batiactu

Article internet / house share

Trophy Batiactu Construction & Innovation Finalist 2012



### À Neuville : une habitation labellisée

Il était l'un des premiers à choisir l'alternative de la maison passive. Voilà maintenant deux ans que le couple Comand habite une construction sans radiateur, avec des matériaux écologiques. Il en tire un bien-être.

« Il ne s'agit pas de dire, dans la région, de devenir la maison passive. L'une est située à Fumay, l'autre à Neuville. La famille Comand a obtenu la plaque de certification en juin. Cela représente 1 000 euros en frais de procédure. Et pourtant, les propriétaires ne participent pas aux portes ouvertes de ce week-end. Problème de communication entre organismes, très certainement. Ce n'est pas pour ça que j'ai participé. » A l'aise, mais Sylvie Comand, elle occupe la maison de



La maison passive a été labellisée. Sylvie Comand est satisfait de ses nouvelles habitudes de vie. L'architecte a toujours plus de demandes.

« On apprend jour après jour à y vivre, à gérer l'usage du soleil pour ne pas souffrir, à sensibiliser les enfants aux ouvertures réfléchies des fenêtres. Il faut maîtriser les aspects techniques, comme l'entretien des fil-



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