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Passivhouse Summary – Individual House in Alixan (F)

Single family house, 1 route de Chateauneuf 26300 ALIXAN, France

(Passivhouse Database 4823)

The project started in 2013 when a family bought this 1980 single-family house. There was some moisture in the house, poor thermal insulation and it was too small for the entire family.

After considering destroying it and rebuilding it, the architect and myself proposed to investigate a passive refurbishment with a little extension of 30 m².

The project ended in 2016 and was certified in 2016.

PROJECT Key points

U-value external walls	0.128 W/m².K	**PHPP space heat demand**	**9 kWh/m².year**
U-value floor	0.131 W/m².K	PHPP Primary energy demand	70 kWh/m².year
U-value roof	0.131 W/m².K	Pressure test n_{50}	0.53 h^{-1}
U-value window	0.68 W/m².K	Heat recovery	82.5%

PHI Certified windows: Pro PassivehausFenster : Smartin Classic

PHI Certified ventilation unit : Zehnder Confoair 200

2.2 SHORT PROJECT DESCRIPTION

2.2.1 The house in 2013, as bought before refurbishment

Figure 1 - as bought in 2013

Figure 2 - Moisture between inside insulation and concrete

2.2.2 THE REFURBISHMENT PROJECT

We kept the foundations, the walls but not the existing interior insulation, and only a part of the south wall, because a very large window was installed.

Figure 3 - Straw bale installation

2.3 ELEVATION (order : West, North, East and South)

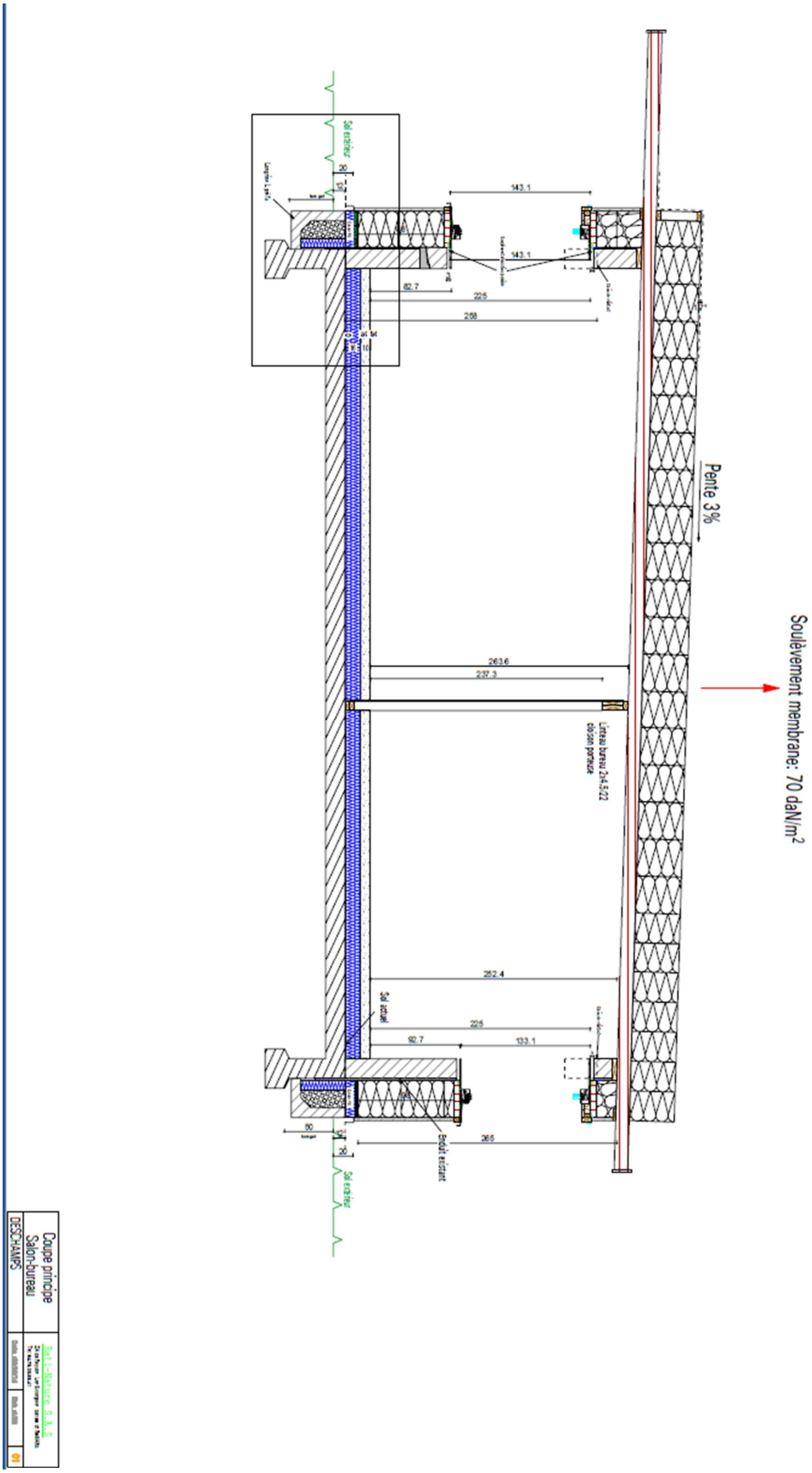
2.4 INTERNAL VIEW

Figure 4 LEFT: Kitchen RIGHT: Living room

Figure 5 LEFT: Bathroom and home office RIGHT: Sleeping room

Figure 6 - Living room panorama

2.5 CROSS SECTION

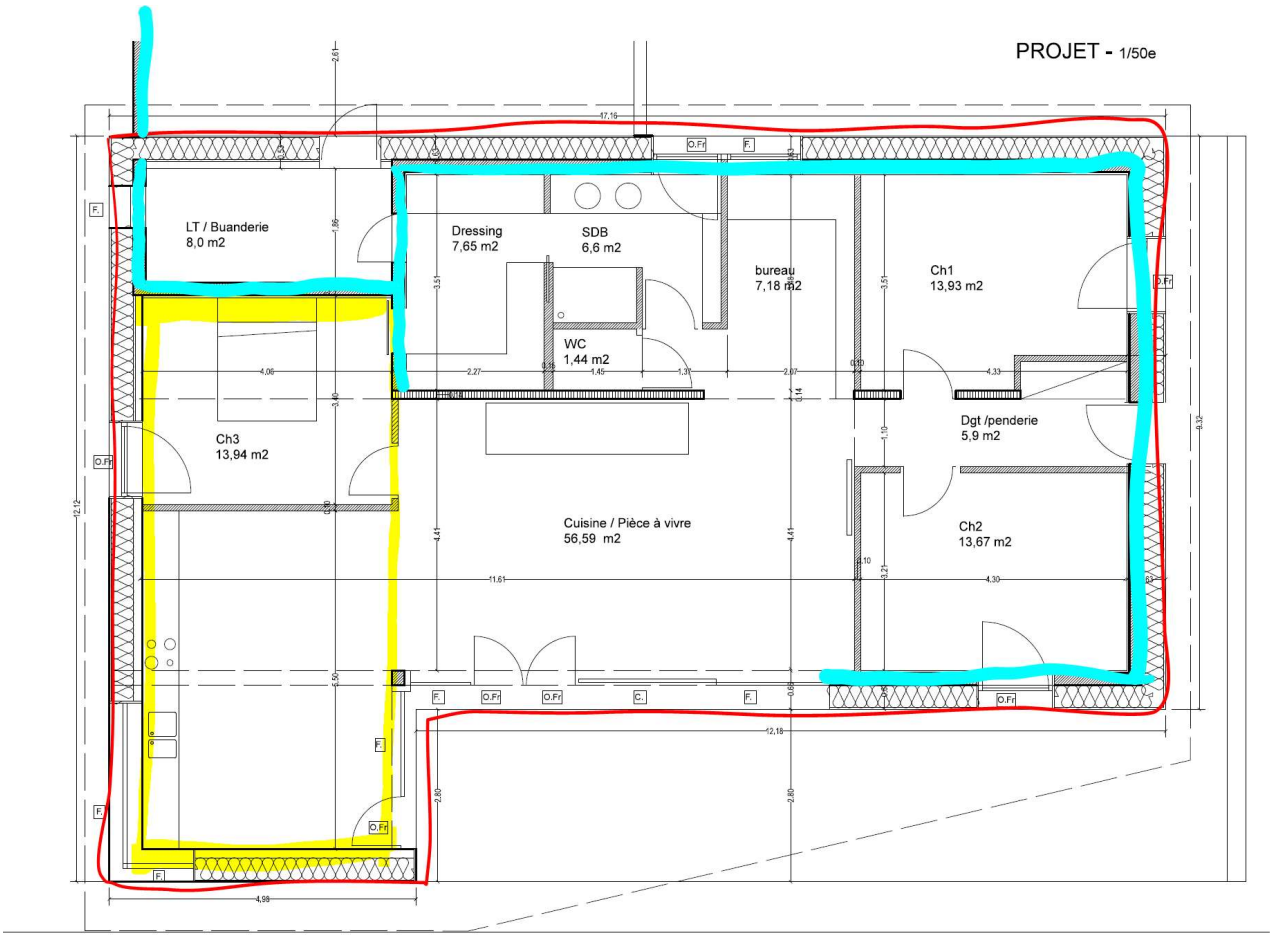


2.6 FLOOR PLAN

In Blue, the old walls (masonry)

In Yellow the new timber, wood frame walls

In Red the limit for insulation and blower-door test



2.7 CONSTRUCTIONS DETAILS

2.7.1 Walls

Most of existing walls are preserved. The thin insulation was removed

See photos in § 2.2.2

An external wood structure is built, and straw balls are inserted in the structure.

2.7.2 Windows

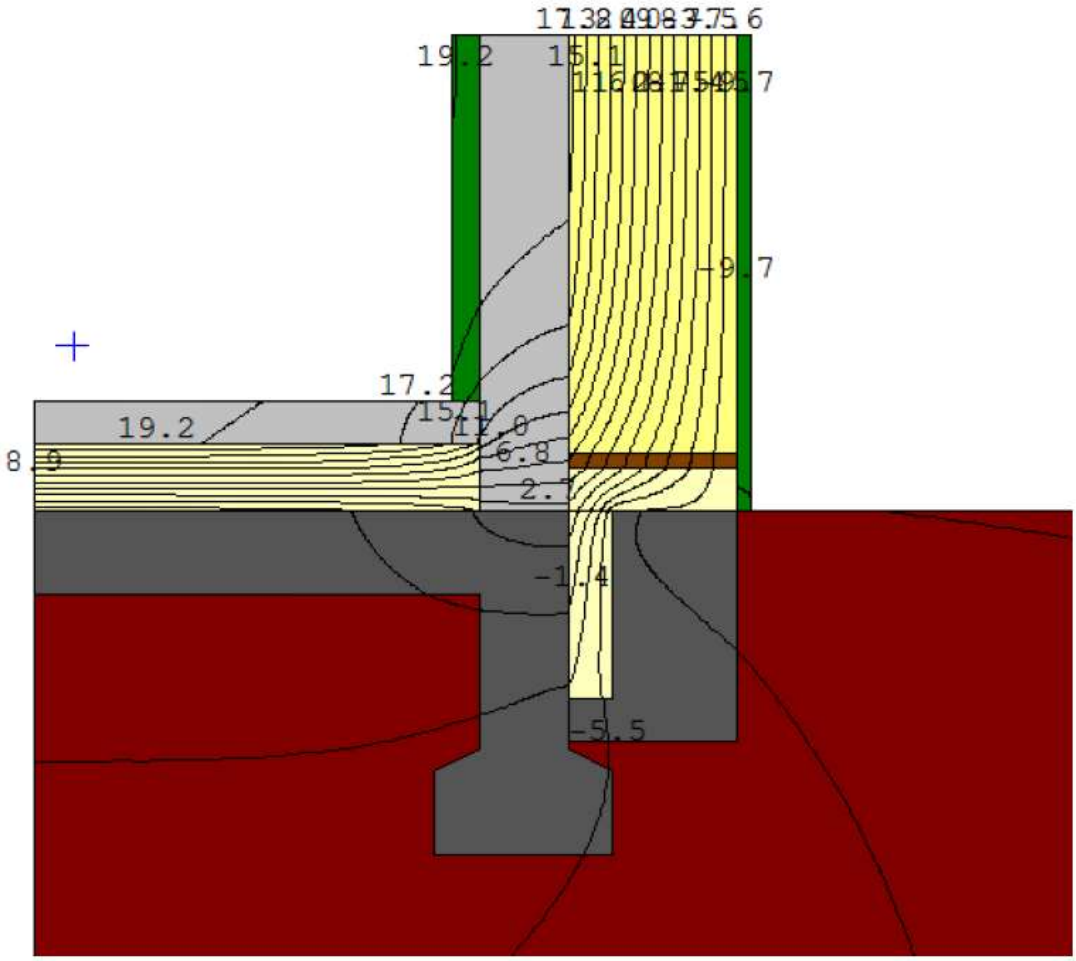
All windows are PHI certified, triple glazing, model Smartwin from Propassivhaus manufacturer.

A large sliding windows is installed

2.7.3 Thermal bridge with basement

The most difficult point was the thermal bridge due to existing basement. We have made many detailed simulations to obtain an acceptable thermal bridge

The final detail, below, had a value Y= 0.17 W/(m.K) for PHPP with external measurements.



2.7.4 Domestic Hot Water

Solar thermal installation with 2 panels installed on the roof, so with optimal orientation.

This is a drain-back installation to avoid over heating in summer.

2.7.5 Ventilation strategy

Zehnder Confoair 200 inside thermal envelope, close to a wall (Outside air on the left).

3 speeds (Standard, reduced, maxi when kitchen and bathroom are used).

We have installed CO2 sensors in 3 rooms, and CO2 is always below 1200 ppm, and nearly always below 1000 ppm.

2.7.6 Heating strategy

Heating via

- an electric heater after the ventilation unit, controlled by a manual switch, to be sure it will heat only in winter. Air ducts are insulated.

- towel dryer in the bathroom


Heater

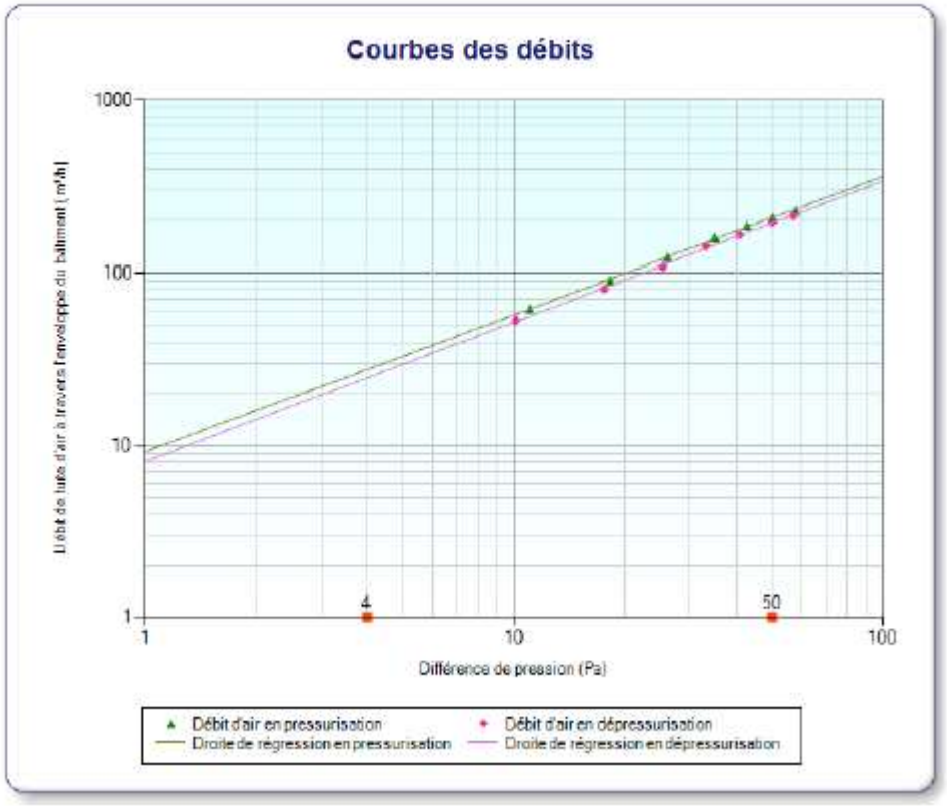

Heater
Outside
Air

2.8 BLOWER DOOR Test

	Taux de renouvellement d'air à 50 Pa en h^{-1}			
	n_{50}= 0.53 h^{-1}			
	$n_{50\ mini}$ = 0.5 h^{-1} $n_{50\ max}$ = 0.56 h^{-1}			
Pressurisation	n_{50}= 0.55 h^{-1} $n_{50\ mini}$ = 0.54 h^{-1} $n_{50\ max}$ = 0.56 h^{-1}		Dépressurisation	n_{50}= 0.51 h^{-1} $n_{50\ mini}$ = 0.50 h^{-1} $n_{50\ max}$ = 0.53 h^{-1}

	Débit de fuite d'air à 50 Pa en m^3/h			
	$\dot{V}_{50}$=199.92 m^3/h			
	$\dot{V}_{50\ min}$ = 188.65 m^3/h $\dot{V}_{50\ max}$ = 211.16 m^3/h Pourcentage d'incertitude : 5.63			
Pressurisation	$\dot{V}_{50}$= 206.52 m^3/h $\dot{V}_{50\ min}$ = 201.99 m^3/h $\dot{V}_{50\ max}$ = 211.16 m^3/h		Dépressurisation	$\dot{V}_{50}$= 193.32 m^3/h $\dot{V}_{50\ min}$ = 188.65 m^3/h $\dot{V}_{50\ max}$ = 198.09 m^3/h

12 Graphique (Courbe des débits de fuite)



NB: Full report available in a separate PDF file

2.9 VERIFICATION

It was possible to achieve full passive house (instead of Enerphit)

Conception bâtiment passif

Projet:	Projet Deschamps / Forel
Adresse:	1 route de chateauneuf
Code postal / localité:	26300 ALIXAN
Pays:	France
Type de bâtiment:	Rénovation et extension maison individuelle
Donnée climatique:	F - Montélimar
Maître(s) de l'ouvrage:	Mr Deschamps Mme Forel
Adresse:	1 route de chateauneuf
Code postal / localité:	26300 ALIXAN
Architecte:	Hélène Palisson et Stéphane Peignier (Arkétype)
Adresse:	2 avenue Joannes Masset
Code postal / localité:	69009 LYON
Bureau d'étu. fluides / TS:	HELIASOL
Adresse:	15 allée des magnolias
Code postal / localité:	69390 VOURLES

Année de construction:	1980			
Nombre de logements:	1	Apports de chaleur internes:	2.1	W/m²
Vol. ext. du bâtiment V_e:	575.1	m³ moyenne hauteur d'étage:	2.5	m
Nombre d'occupants:	3.9			

Valeurs caractéristiques du bâtiment par rapport à la surface de référence énergétique et par année — utilisé: Méthode annuelle

				Critères	Respectés?*
	Surface de référence énergétique:	135.2	m²		
Chauffer	Besoin de chaleur de chauffage	**9**	**kWh/(m²a)**	15 kWh/(m²a)	**oui**
	Puissance de chauffage	**10**	**W/m²**	10 W/m²	**oui**
Refroidir	Demande totale de refroidissement		**kWh/(m²a)**	-	**-**
	Puissance de refroidissement		**W/m²**	-	**-**
	Fréquence de surchauffe (> 25 °C)	4.1	%	-	**-**
Energie primaire	Chauffer, refroidir, déhumidification, ECS, électricité auxiliaire domestique et aux.	**70**	**kWh/(m²a)**	120 kWh/(m²a)	**oui**
	ECS, chauffage et électricité auxiliaire	37	kWh/(m²a)	-	**-**
	Réduction énergie prim. par la prod. d'élec. solaire		kWh/(m²a)	-	**-**
Etanchéité à l'air	Test d'infiltrométrie n_{50}	**0.5**	**1/h**	0.6 1/h	**oui**

* cellule vide: données manquantes; '-': aucune exigence

2.10 CONSTRUCTIONS COSTS

The construction cost with a part of self-building by the owner, is 1000 € per m² of TFA (Treated Floor Area)

And estimated to 1350 € / m² without any self-building.

Surface habitable (SHAB):	**135**	**m2**
Surface Hors œuvre nette (SHON):	170	m2
Couts réels /m2 SHAB *- avec auto const*	***1 001***	***€ /m2 HT***
Couts Estimés /m2 SHAB *- sans auto co*	***1 356***	***€ /m2 HT***

LOTS	**couts Réels HT*** avec auto construction	**Entreprises € HT** sans auto construction
Terrassement VRD	1 563	3 046
Maçonnerie	2 806	15 417
Ossature bois/isolation	4 779	10 800
Toiture Bois massif + menuiseries extérieures	55 630	55 630
Couverture /zinguerie	5 892	15 500
Cloisons/Plâtrerie/menuiseries intérieures	4 878	17 333
dalle béton ciré + isolant 160mm	14 470	14 470
Electricité	3 178	6 542
Plomberie et sanitaires	3 984	6 410
CESI (Chauffe-eau solaire individuel)	3 939	3 939
VMC	7 662	7 662
ITE paille comprimée + Enduits extérieurs	26 583	26 583
MONTANT DES TRAVAUX **	**135 364**	**183 332**
Ratio: en €/m2 SHAB	*1 001*	*1 356*
* TVA à 20%		
** Hors Achat terrain + honoraires architectes et BE, certification, taxes, aménagements spécifiques		
Achat terrain	155 000	155 000
Assainissement	3 730	12 083
peinture/huile plafond	2 152	9 750
Mobilier intérieurs	2 700	3 750
Electroménager	1 650	1 375
COUT TOTAL	**300 596**	**365 290**

2.11 YEAR OF CONSTRUCTION

1983, complete refurbishment 2015-2016

2.12 OVERVIEW

This project is a good example of passive refurbishment, for a typical one family house built in years 1970-1980 and very poorly insulated.

Most of building components with high embodied energy (grey energy) were maintained.

The passive house standard was achieved (and not only EnerPhit) and after 2 years, the measurements have confirmed the high performance of this building.

2.13 EXPERIENCE

The house has now been occupied for three years, and the feedback from the occupants is enthusiastic.

To confirm the summer comfort, which is in this area a major concern, we have temperature monitoring in every room, including CO2 and humidity.

The heating system was used 200 hours per winter and is activated manually. This does not include the electric heater of the bathroom, which is used more often.

To conclude, this project has been presented several times in conferences, Passibat Paris (French congress for passive house), and the ESBG, European Straw congress.

2.14 REFERENCES

Passibat 2016 in Paris : conference (no web link)

ESBG (European Straw Bale Gathering) 2015 in Paris (no web link)