Project Documentation
Gebäude-Dokumentation

Abstract | Zusammenfassung

Detached House in Henley-on Thames, UK

Data of building | Gebäudedaten			
Year of construction Baujahr	2021	**Space heating** **Heizwärmebedarf**	**14** **kWh/(m^2a)**
U-value external wall U-Wert Außenwand	0,098 W/(m^2K)		
U-value basement U-Wert Kellerdecke	0,107 W/(m^2K)	Primary Energy Renewable (PER) Erneuerbare Primärenergie (PER)	67 kWh/(m^2a)
U-value roof U-Wert Dach	0,083 W/(m^2K)	Generation of renewable Energy Erzeugung erneuerb. Energie	11 kWh/(m^2a)
U-value window U-Wert Fenster	0,95 W/(m^2K)	Non-renewable Primary Energy (PE) Nicht erneuerbare Primärenergie (PE)	155 kWh/(m^2a)

Heat recovery Wärmerückgewinnung	91 %	Pressurization test n_{50} Drucktest n_{50}	0,3 h^{-1}
Special features Besonderheiten	Brick and block self built house		

Brief Description

Bridleway House

This detached house is a Passivhaus new construction project, located in Nettlebed, Henley-on Thames. The three-storey dwelling (two floors plus an attic) faces West orientation (front façade) and has a Treated Floor Area of 126m^2.

The house has a solid construction consisting of insulated cavity walls, solid concrete slab and insulated I-joists sloped roof, and was built by Catlin Ltd. The low form factor and high levels of insulation (which achieved very low U-values) allowed the house to meet the Passivhaus standard. Also, the excellent construction quality and attention to detail with regards to the airtightness strategy, which obtained a final result of 0.31 ach/h @50 Pa. The project included PV generation to offset electricity consumption.

Note Bridleway project was handed over from Green Building Store, who did the initial PHPP. The information on this report relates to the work done after hand over, from Detailed Design stage onwards.

Responsible project participants
Verantwortliche Projektbeteiligte

Architect Entwurfsverfasser	Lacey Interior Architecture Ltd https://laceystudio.weebly.com/
Implementation planning Ausführungsplanung	Lacey Interior Architecture Ltd https://laceystudio.weebly.com/
Building systems Haustechnik	Green Building Store (Ventilation) https://www.greenbuildingstore.co.uk/
Structural engineering Baustatik	-
Building physics Bauphysik	Nuria Fernandez Lopez, QODA Consulting Ltd. https://www.qodaconsulting.com/
Passive House project planning Passivhaus-Projektierung	Nuria Fernandez Lopez, QODA Consulting Ltd. https://www.qodaconsulting.com/
Construction management Bauleitung	Catlin Ltd. https://www.dcatlin.co.uk/homepage/

Certifying body
Zertifizierungsstelle

Passivhaus Institut Darmstadt www.passiv.de	MEAD: Energy & Architectural Design Ltd http://www.meadconsulting.co.uk/

Certification ID **Zertifizierungs ID**	
7325	Project-ID (www.passivehouse-database.org) Projekt-ID (www.passivhausprojekte.de)

Author of project documentation **Verfasser der Gebäude-Dokumentation**	
Passivhaus Institut Darmstadt www.passiv.de	Nuria Fernandez Lopez, QODA Consulting Ltd.
Date Datum	Signature Unterschrift
18.08.2023	

1. View of Bridleway House

Front facade
West orientation

Side facade
North orientation

Side facade
South orientation


Back facade
East orientation

2. Interior Photos


Kitchen

3. Sectional drawing

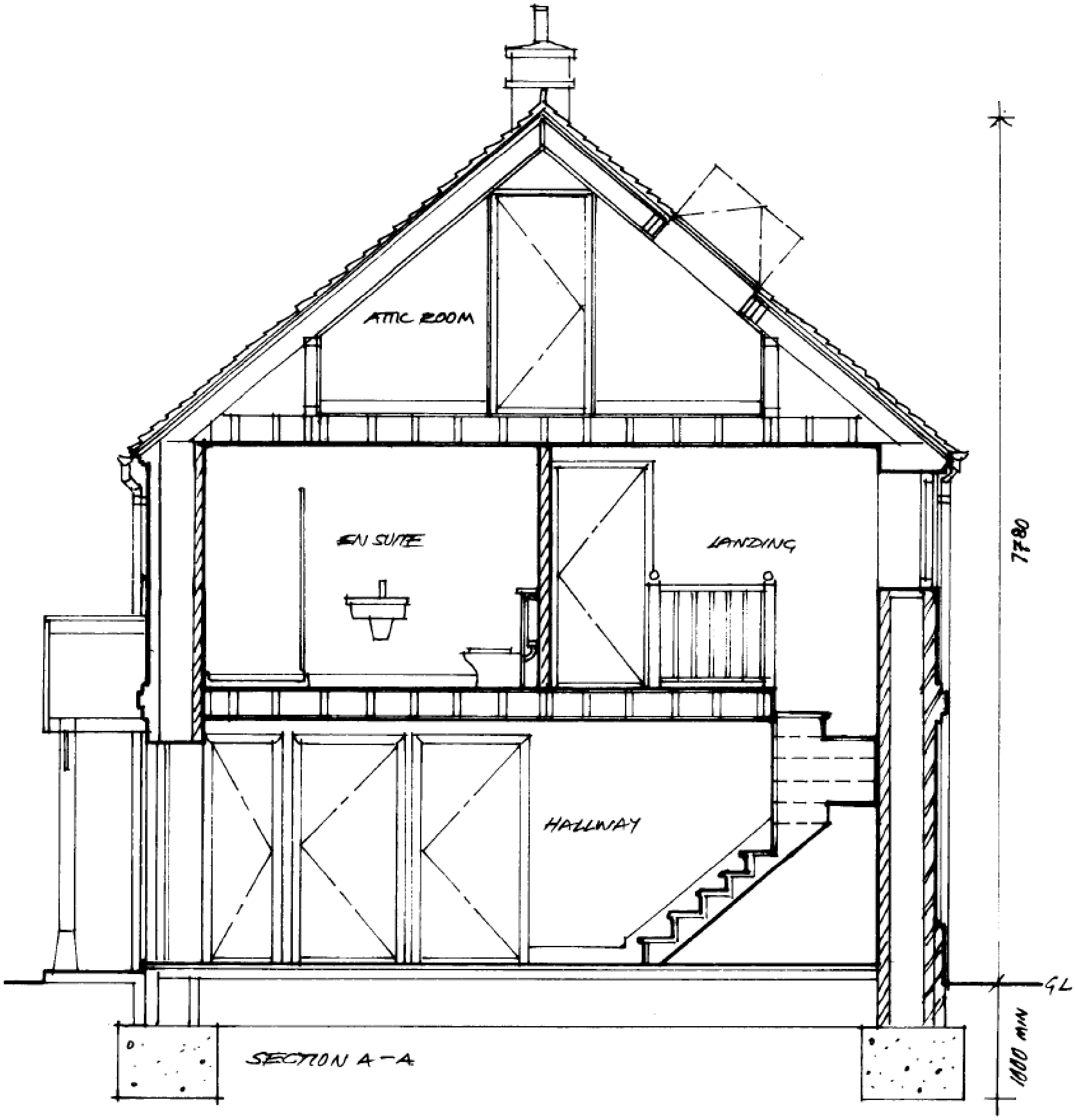


Figure 1. Cross Section. Drawing by Lacey Interior Architecture Ltd.

Short section of the house from West to East facades showing thermal envelope, interior spaces and attic extent. The thermal envelope follows the lines of the external elements. Therefore, the roof is insulated at pitch level to the wall junction and all accesible and non-accessible attic spaces are inside the thermal envelope. See Section 7 for more detail of this juntion.

4. Floor plans

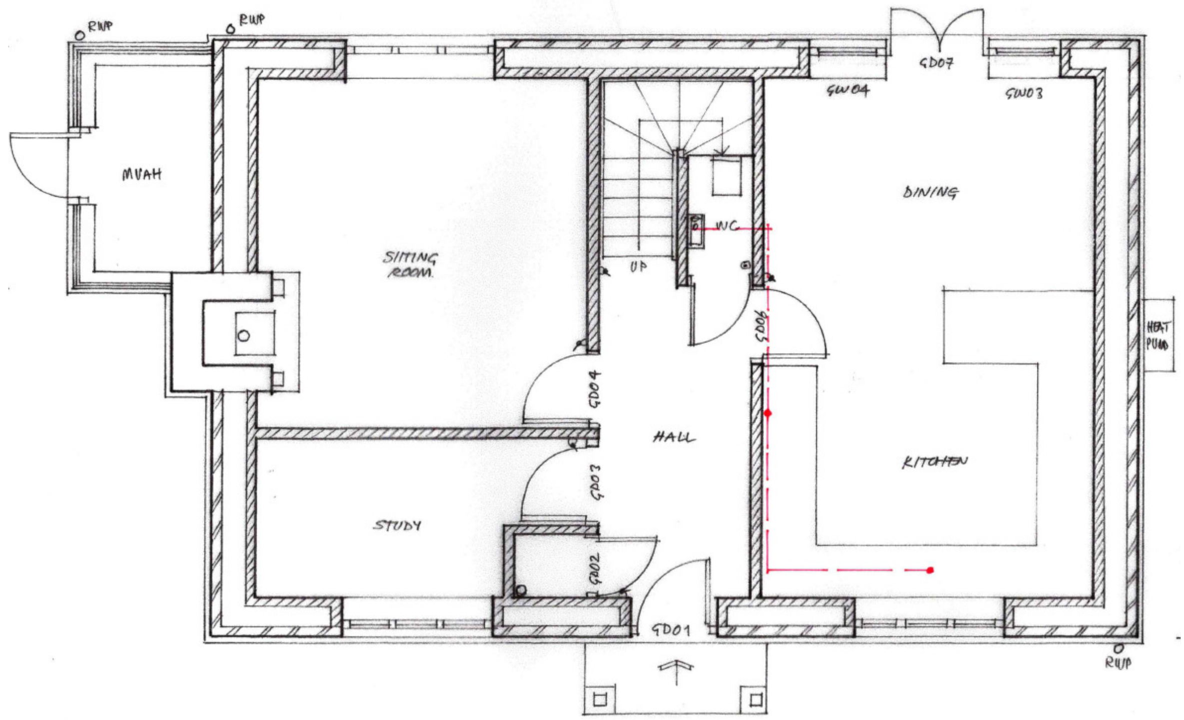


Figure 2. Ground Floor Plan. Drawing by Lacey Interior Architecture Ltd.

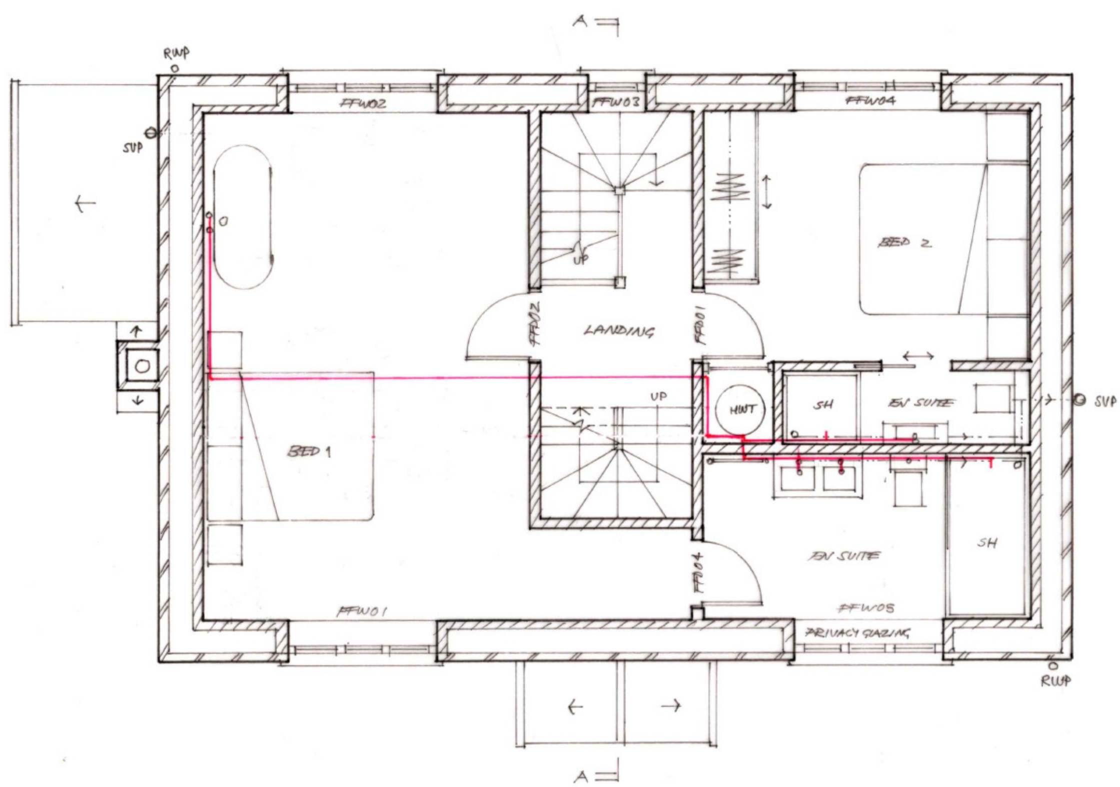


Figure 3. First Floor Plan. Drawing by Lacey Interior Architecture Ltd.

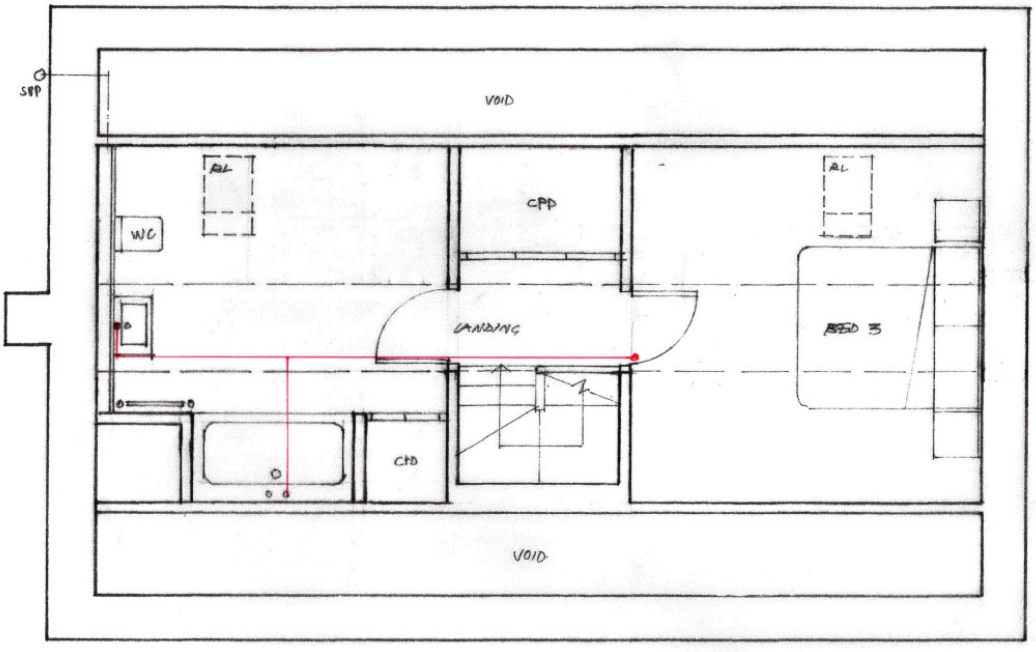


Figure 4. Attic Floor Plan. Drawing by Lacey Interior Architecture Ltd.

The drawings above show the internal distribution of Bridleway House for each of the three storeys and the thermal envelope contained within the external walls. Day living areas (kitchen-dinning, sitting, study room and WC) are on the Ground Floor and night living areas (3 bedrooms and 3 bathrooms) are distributed between the First and Second floor (Attic).

The chimney in the sitting room is room sealed and with its own air supply duct.

*Note the MVHR external room was not built. The unit was initially proposed to be located externally, but it was advised to be included within the thermal envelope and it is now located in the Attic.

5. Floor Slab Construction

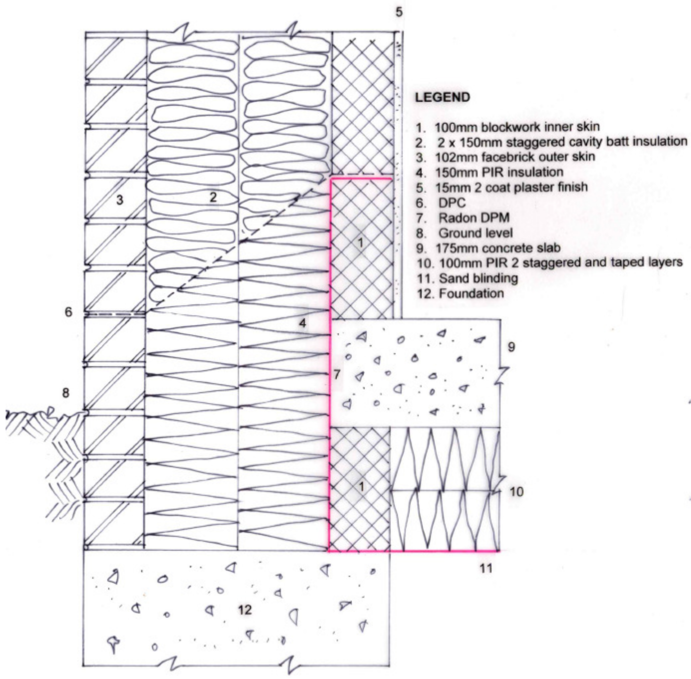


Figure 5. Ground floor to external wall junction. Drawing by Lacey Interior Architecture Ltd.

The floor slab consists of (from external to internal):

• Sub-base

• Damp proof membrane

• 2x100mm IKO Enertherm (λ = 0.022 W/mK)

• 170mm Concrete slab

U-value Ground Floor = 0.107 W/m2K

To reduce the floor to wall thermal bridge, the internal cavity wall leaf is built with Celcon HI 7 100mm blocks (λ = 0.18 W/mK) and there are 2x150mm Recticel PIR insulation (λ = 0.022 W/mK) in the cavity wall below DPC.

Floor to wall psi value = -0.01 W/mK

Figure 6. Ground floor insulation installed on site.

6. External Walls Construction

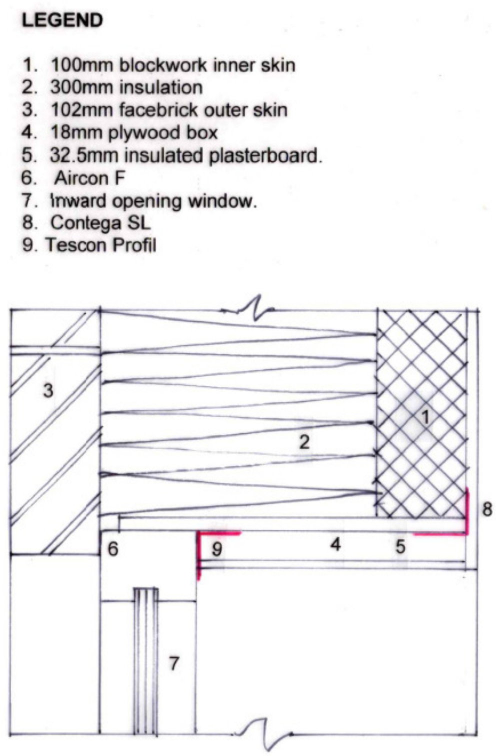


Figure 7. External wall construction.
Drawing by Lacey Interior Architecture Ltd.

The external wall consists of (from external to internal):

• Wood fired brickwork 100mm

• 2x150mm Superglass 32 cavity batts (λ = 0.032 W/mK)

• Celcon HI 7 100mm blocks (λ = 0.18 W/mK)

• Lime plaster finish 15mm

U-value External Wall = 0.098 W/m2K

The insulation batts are staggered and the cavity wall internal and external leafs are held together with low conductivity basalt fibre wall ties as shown in the picture below.

Corner psi value = -0.07 W/mK

Figure 8. Celcon blocks stockpiling and basalt fibre wall ties.

7. Roof Construction

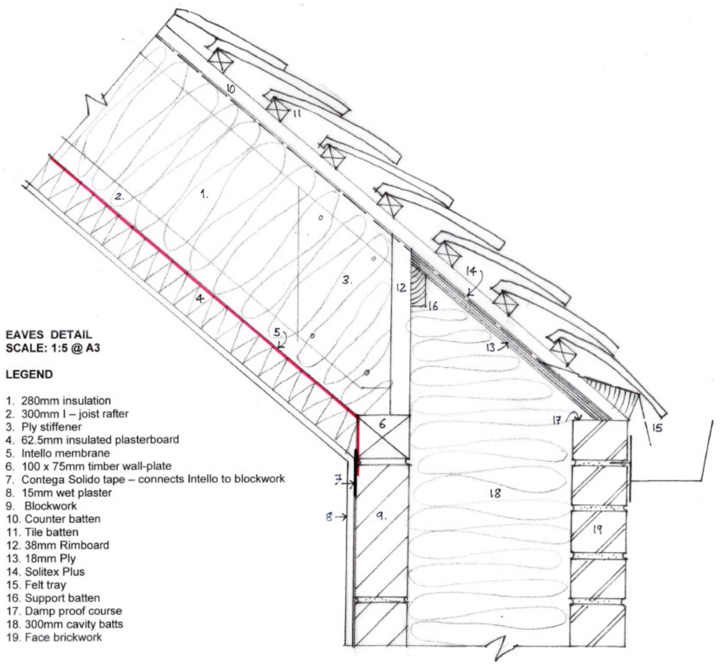


Figure 9. Roof to external wall junction.
Drawing by Lacey Interior Architecture Ltd.

The roof consists of (from external to internal):

• I-joist rafters

• 2x140mm Superglass rafter roll (λ = 0.032 W/mK)

• Pro Clima Intello Plus airtightness membrane

• 62.5mm insulated plasterboard (λ = 0.018 W/mK)

U-value Ground Floor = 0.083 W/m2K

Eaves psi value = -0.001 W/mK

Gable psi value = -0.050 W/mK

Ridge psi value = -0.060 W/mK

Figure 10. Roof insulation installed on site.

8. Windows and doors

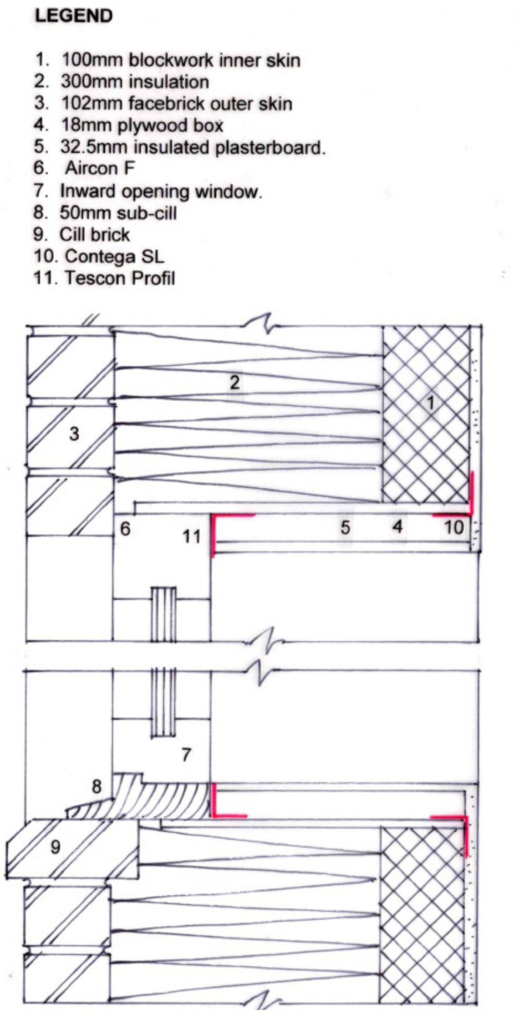


Figure 11. Windows installation detail. Drawing by Lacey Interior Architecture Ltd.

Windows and glazed doors are Norrsken triple glazed composite (P44A windows/ S310A doors). These are installed in the insulation layer, using insulated plasterboard (λ = 0.018 W/mK) to reduce the installation thermal bridge.

Doors are installed on Compact Foam (λ = 0.046 W/mK).

U-value installed (averaged) = 0.94 W/m2K

	Side	Unit	Windows	Doors
Frame U-value	left	W/m2K	0.9	0.9
	right		0.9	0.9
	bottom		0.9	0.9
	above		0.9	0.9
Frame width	left	W/m2K	0.123	0.124
	right		0.123	0.124
	bottom		0.123	0.204
	above		0.123	0.124
Glazing edge ψ		W/mK	0.052	0.052
Installation ψ	left	W/mK	0.010	0.010
	right		0.010	0.010
	bottom		0.040	-0.219
	above		0.010	0.040
Glazing U-value		W/m2K	0.5	0.5
Glazing g-value		%	53	53

Table 1. Windows and doors specification

Rooflights are Fakro FTT U8 Thermo 2012. The I-joist flange is insulated with 25mm Celotex (λ = 0.022 W/mK) and insulated plasterboard is installed at reveals.

U-value installed (averaged) = 1.32 W/m2K

Figure 12. Windows installed on site.

9. Description of the Airtight Envelope

The project followed a very robust airtightness strategy which allow it to achieve a very good final result. The airtightness line is placed internally, using existing construction materials where possible and adding propietary airtightness elements where necessary.

Main airtightness line elements:

- Floor: concrete slab
- External walls: wet lime plaster 15mm.
- Roof: Pro Clima Intello Plus airtightness membrane.
- Windows and doors: Norrsken triple glazed composite (P44A windows/ S310A doors).
- Rooflights: Fakro FTT U8 Thermo 2012 rooflights.

Junctions airtightness line elements:

Propietary airtightness tape:

- Over Pro Clima Intello Plus airtightness membrane junctions.
- Between windows and doors and plaster.
- Around ducts and pipework penetrations.
- Over socket cutouts in blockwork

Blowerproof airtightness paint:

- Behind internal partition walls on the internal blockwork layer of external walls.
- Behind intermediate floors on the internal blockwork layer of external walls.
- Over socket cutouts in blockwork.

Grommets:

- Around MVHR ductwork penetrations.

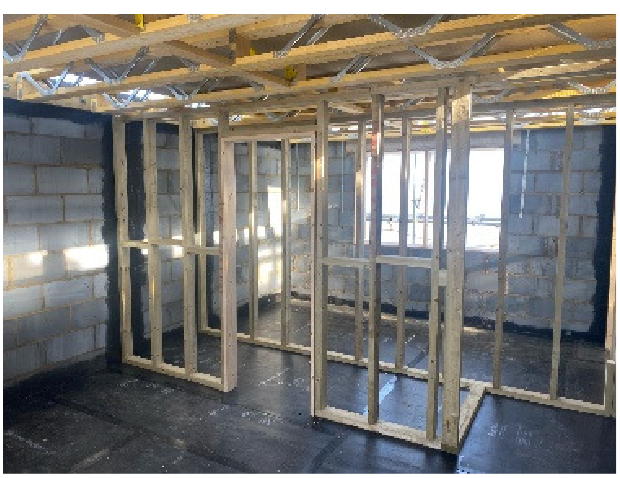


Figure 13. Floors and walls airtightness measures.

Figure 14. Roof airtightness measures.

Figure 15. Windows airtightness measures.

Figure 16. Services airtightness measures.

One forensic blower test was carried out after plastering (and before second fix) and another one at the end. Here are the results of the final airtightness test done on February 2022, which achieved a very good result, as low as 0.31 ach/h @ 50Pa.

Low Energy Summary of Air Permeability Tests

New Build Air Testing Ltd

ATTMA — The Air Tightness Testing & Measurement Association

Test Undertaken By	Vince May of New Build Air Testing Ltd

Building Details				
Building identifier:				
Site address:	Bridalway House, Park Corner, Nettlebed, Henley On Thames, Oxfordshire, RG9 6DR			
Size:	Footprint (m^2)	Envelope (m^2)	Volume (m^3)	Storey
	60.66	317.34	268	3

Test Details			
Report reference:	3867		
Date:	08/02/2022	Build progress:	Final
Temporary sealing:	MVHR		

Deviations from Test Standard		
Direction:	Pressurise +	Depressurise −
Deviations:	None	None
Notifications:		

Results		
Direction:	Pressurise +	Depressurise −
UCRN:	11068232	11068231
Air Flow Coefficient (C_{env}):	4.879	2.997
Air Leakage at 50 Pa (Q_{50}):	82.840	82.840
Air Flow Exponent (n):	0.71	0.86
Coefficient of Determination (r^2):	0.981	0.988

Air Permeability			Pass
Target:	<= 0.60	$m^3.h^{-1}.m^{-2}$@50Pa	**0.26** $m^3.h^{-1}.m^{-2}$@50Pa ✓
Pressurisation Test: +	0.25	$m^3.h^{-1}.m^{-2}$@50Pa	
Depressurisation Test: −	0.27	$m^3.h^{-1}.m^{-2}$@50Pa	

Air Changes Per Hour			Pass
Target:	<= 0.6	$m^3.h^{-1}.m^{-3}$@50Pa	**0.31** $m^3.h^{-1}.m^{-3}$@50Pa ✓
Pressurisation Test: +	0.30	$m^3.h^{-1}.m^{-3}$@50Pa	
Depressurisation Test: −	0.32	$m^3.h^{-1}.m^{-3}$@50Pa	

Figure 17. Final airtightness test results.

10. Ventilation Unit

An MVHR with heat recovery is installed in the attic. This is a Ubiflux Vigor 325 with high heat recovery efficiency (91%).

Figure 18. Ubiflux Vigor 325 MVHR unit

Manufacturer	Ubbink
Model	Ubiflux Vigor 325
Heat recovery efficiency	91%
Specific efficiency	0,21 Wh/m³

Figure 19. Unit and ducts as installed on site.

11. Ventilation Duct Work

The MVHR design was completed by Green Building Store. Below are section and plan drawings showing the unit location, which is installed in the attic. The intake (dark blue) and exhaust (turquoise) ducts pass to exterior through the sloped roof, keeping the necessary distance between them. These are 160mm diameter with 15mm ComfoPipe and a wrap of 25mm closed cell insulation.

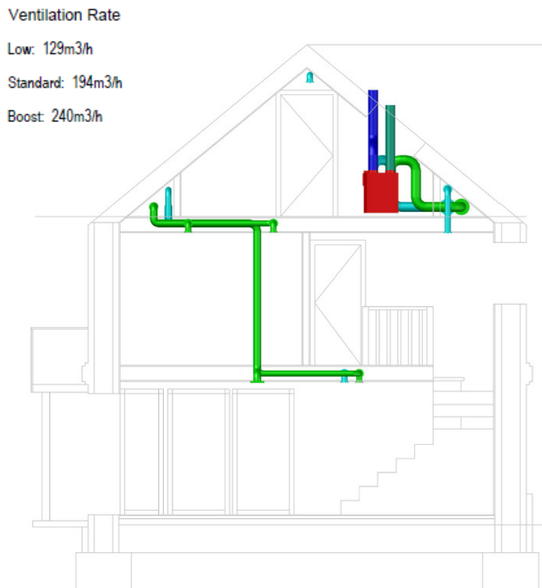


Figure 20. MVHR design section.
Drawing by Green Building Store.

The supply and extract ducts run through the sides of the attic and below the ridge and drop down to each living area (blue) and bathrooms and kitchen (green).

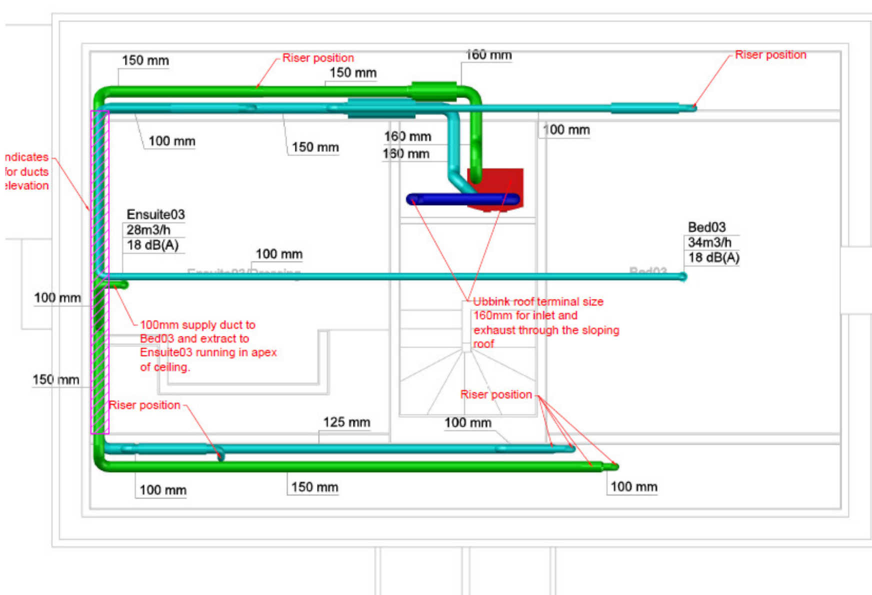
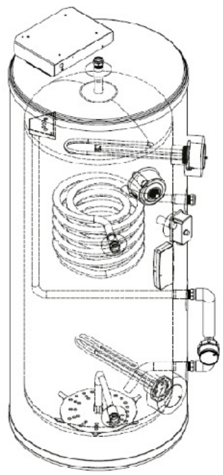


Figure 21. MVHR design plan (attic level).
Drawing by Green Building Store.

12. Heating and DHW system



Heating is provided by electric panel radiators in each habitable room: bedrooms, living room and dining room (700W each). On the other side, Domestic Hot Water is supplied by an efficient Mixergy DHW cylinder with 210 litres capacity and Efficiency rating B.

The cylinder is located in a cupboard on the first floor, next to the stairs landing, where it is closed to most of the bathrooms and wet areas to reduce pipes lengths.

Four ground mounted PV panels are installed on site to offset electricity consumption. JA Solar 365W Mono panels (1.46 kWp). 97% inverter efficiency.

PER Generation= 11 kWh/m2a.

13. Building Costs

Bridleway House is a self built project, so there is not a calculated overall cost. However, the owner and builder has provided an overall construction cost o £850,000, including land purchase.

- Land purchase : £300,000
- Build cost estimate: £550,000

15. PHPP Results

Passive House Verification

Photo or Drawing

Building:	Bridleway House
Street:	Park Corner, Nettlebed
Postcode/City:	RG9 6DR Henley-on-Thames
Province/Country:	GB-United Kingdom/ Britain
Building type:	New Build
Climate data set:	GB0002a-Silsoe
Climate zone:	3: Cool-temperate — Altitude of location: 199 m
Home owner / Client:	Mr Daniel Catlin
Street:	Bridleway House, Park Corner, Nettlebed
Postcode/City:	RG9 6DR Henley-on-Thames
Province/Country:	GB-United Kingdom/ Britain
Architecture:	Lacey Interior Architecture Ltd
Street:	40 Hambleden Rise, Skirmett Road, Hambleden
Postcode/City:	RG9 6RL Henley-on-Thames
Province/Country:	GB-United Kingdom/ Britain
Mechanical engineer:	Green Building Store (ventilation)
Street:	Heath House Mill, Heath House Lane, Golcar
Postcode/City:	HD7 4JW Huddersfield
Province/Country:	
Energy consultancy:	QODA Consulting
Street:	1 Ram Court, Wicklesham Lodge
Postcode/City:	SN7 7PN Faringdon
Province/Country:	Oxfordshire
Certification:	Mead Consulting
Street:	
Postcode/City:	
Province/Country:	

Year of construction:	2021	Interior temperature winter [°C]:	20.0	Interior temp. summer [°C]:	25.0
No. of dwelling units:	1	Internal heat gains (IHG) heating case [W/m²]:	2.5	IHG cooling case [W/m²]:	2.5
No. of occupants:	2.7	Specific capacity [Wh/K per m² TFA]:	180	Mechanical cooling:	

Specific building characteristics with reference to the treated floor area

				Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area m²	125.9				
Space heating	Heating demand kWh/(m²a)	14	≤	15	-	yes
	Heating load W/m²	8	≤	-	10	
Space cooling	Cooling & dehum. demand kWh/(m²a)	-	≤	-	-	-
	Cooling load W/m²	-	≤	-	-	
	Frequency of overheating (> 25 °C) %	0	≤	10		yes
	Frequency of excessively high humidity (> 12 g/kg) %	0	≤	20		yes
Airtightness	Pressurization test result n_{50} 1/h	0.3	≤	0.6		yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	155	≤	-		-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	67	≤	60	67	yes
	Generation of renewable energy (in relation to pro-jected building footprint area) kWh/(m²a)	11	≥	-	11	

[2] Empty field: Data missing; '-': No requirement

I confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this verification.

Passive House Classic? yes

Task:	First name:	Surname:	Signature:
	Nuria	Fernandez Lopez	
Issued on:		City:	

Detailed design stage PHPP was completed by Nuria Fernandez Lopez of Enhabit Ltd (now of Qoda Consulting Ltd) using PHPP Version 9.6a. The main PHPP results from the Verification page are shown above.