Project Documentation

ID 7898

1 Abstract

Avery Lodge, detached single storey bungalow with mezzanine.
Sacombe Green, Farm, Ware SG12 0JF

1.1 Data of building

Year of construction/	2024	**Space heating /**	**16 kWh/(m²a)**
U-value external wall/	0.117 W/(m²K)		
U-value Floor/	0.102 W/(m²K)	**Primary Energy Renewable (PER)**	37.2 kWh/(m²a)
U-value roof/	0.108 W/(m²K)	**Generation of renewable energy**	46 kWh/(m²a)
U-value window/	0.95 W/(m²K)	**Non-renewable Primary Energy (PE)**	90 kWh/(m²a)
Heat recovery/	96 %	Pressure test n_{50} /	0.57 h-1
Special features/	27 Solar Panels, ASHP, underfloor heating.		

1.2 Brief Description ...

<u>The site</u>

Avery Lodge is located within the small hamlet of Sacombe Green, Ware. It is located on the land shared with Sacombe farm house, which is a grade 2 listed building in a rural position beyond the greenbelt. Previously part of the local farm, the property and land most recently has been used for equestrian purposes prior to our clients possession.

<u>The building</u>

Avery Lodge is a single story dwelling with mezzanine area over the main living accommodation. It is a detached expansive 2-bedroom property located on Sacombe Green Farm, designed as an annex for the clients elderly mother. Designed as a PassivHaus, the client has remarked on how energy efficient the property has been during their recent occupation.

<u>Planning</u>

The proposal sort to replace an existing cumbersome concrete barn with Avery Lodge. Due to the nature of this project, it required planning approval from East Herts Council.

The local authority initially refused the application in the first instance under 'an intensification for residential'. Subsequently we look this decision to appeal where we were granted permission on the grounds of improving the visual impact. The inspectorate was also pleased that the proposal would meet PassivHaus standards and made this a planning condition.

Photo: Existing concrete barn and stables

Photo: grade 2 listed farm house

SE Elevation view of the building

SW Elevation view of the building

Interior views of the building

1.3 Responsible project participants

Architect/	Emma Warren https://www.adpractice.co.uk/
Implementation planning/	Emma Warren https://www.adpractice.co.uk/
Building systems/	Prefab timber frame – MBC timber frame UK ltd. MVHR – 21 Degrees ASHP – Green Building renewables PV – Chiltern Solar
Structural engineering/	Adept Consulting (UK) for MBC Timber Frame UK Ltd.
Building physics/	Emma Warren https://www.adpractice.co.uk/
Passive House project planning/	Emma Warren https://www.adpractice.co.uk/
Construction management/	Oaklands Build -Plant Ltd
Certifying body/	ZE Passivhaus Services Ltd www.zepassiv.com
Certification ID/	(www.passivehouse-database.org) ID 7898
Author of project documentation /	Emma Warren https://architects-register.org.uk/Architect/100474C?filterId=Architect
Date, Signature/	 03.06.2025

Table of Contents

2 FINAL PHPP VERIFICATION

Specific building characteristics with reference to the treated floor area							
	Treated floor area	m²	258.4		Criteria	Alternative criteria	Fullfilled?[2]
Space heating	Heating demand	kWh/(m²a)	16	≤	15	-	yes
	Heating load	W/m²	9	≤	-	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	0.6	≤	0.6		yes
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	80	≤	-		-
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	33	≤	45	33	yes
	Generation of renewable energy (in relation to projected building footprint area)	kWh/(m²a)	48	≥	60	46	

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

TECHNICAL DRAWINGS

2.1 Location

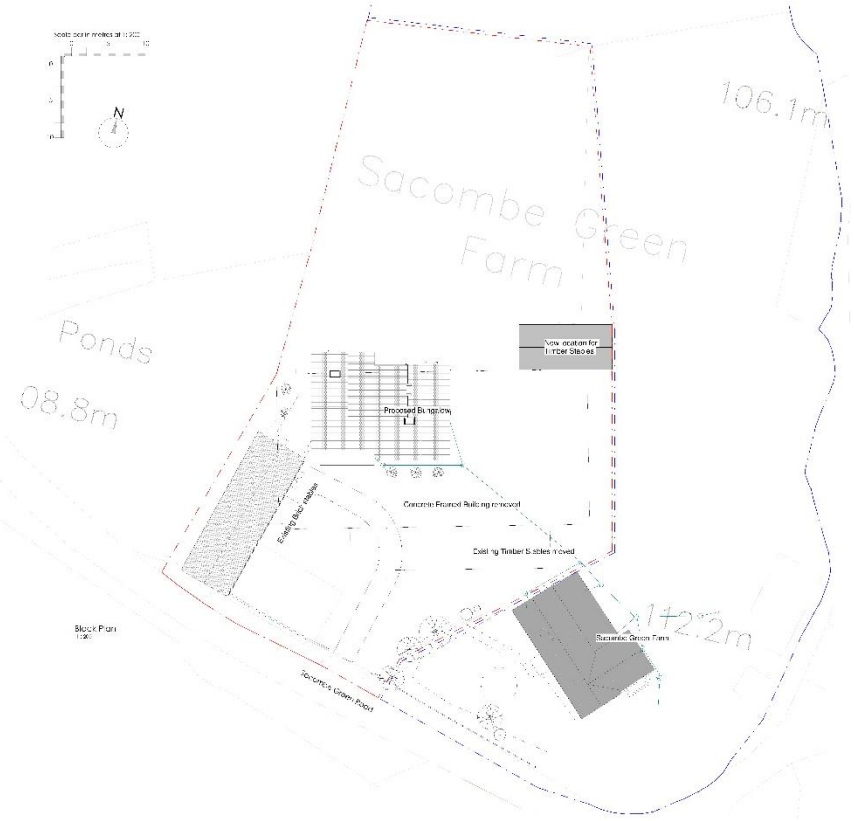


Image: Site plan of sacombe green farm

Image: Arial view of sacmobe green farm illustrating its rural location (still showing old concrete barn)

2.2 Floor plans

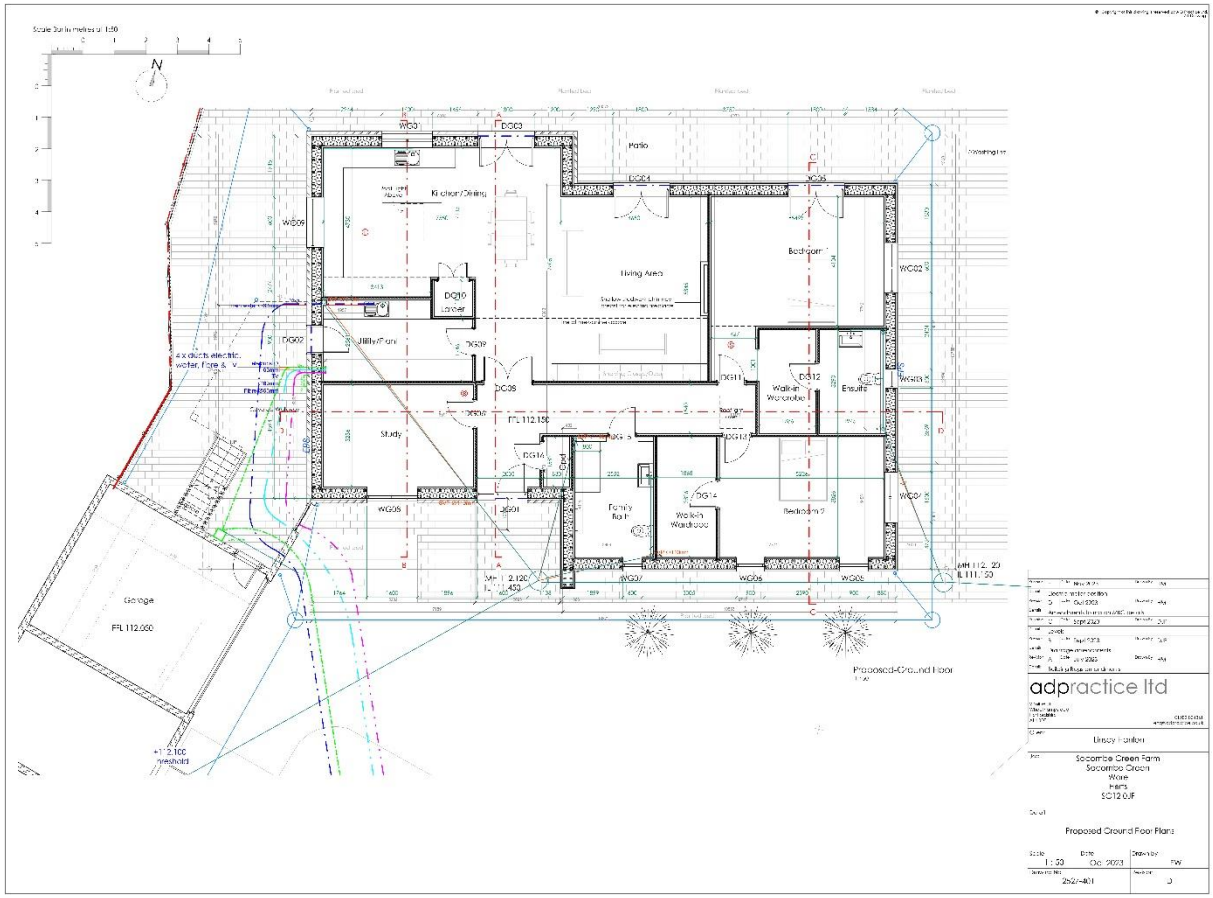


Image: Ground floor plan

This single-storey, level-access home was designed as a generous two-bedroom dwelling with a separate study, offering flexibility for work or guests. The client's brief was to create a low-energy, accessible home that would be comfortable, future-proof, and closely connected to the surrounding countryside.

Large windows and a simple, open plan layout help to bring in natural light and views, reinforcing that connection to the outdoors while supporting the building's passive solar design.

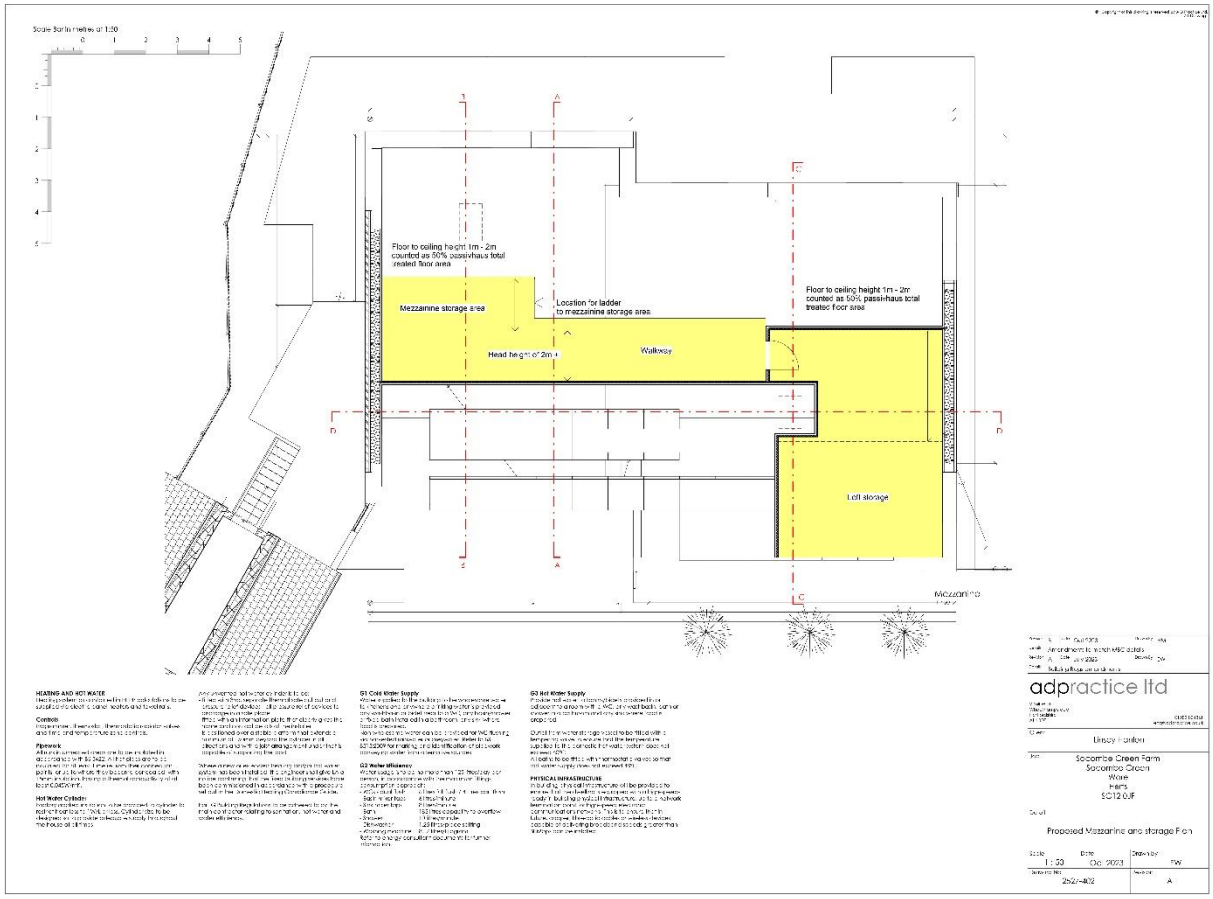


Image: Mezzanine floor plan. The area of the mezanine is shown in yellow.

The mezzanine level was introduced later in the design process to help meet Passivhaus performance targets, specifically to improve the floor area-to-volume ratio in PHPP. As the building was originally conceived as a single-storey dwelling, adding usable space within the roof presented some design challenges — particularly in creating accessible, habitable space that would still comply with Building Regulations.

This was resolved with a library-style ladder to access the mezzanine, keeping the structure lightweight and space-efficient. The area is now used by the client's grandson as a quiet reading nook, adding a personal and functional touch to the home.

2.3 Elevation plans

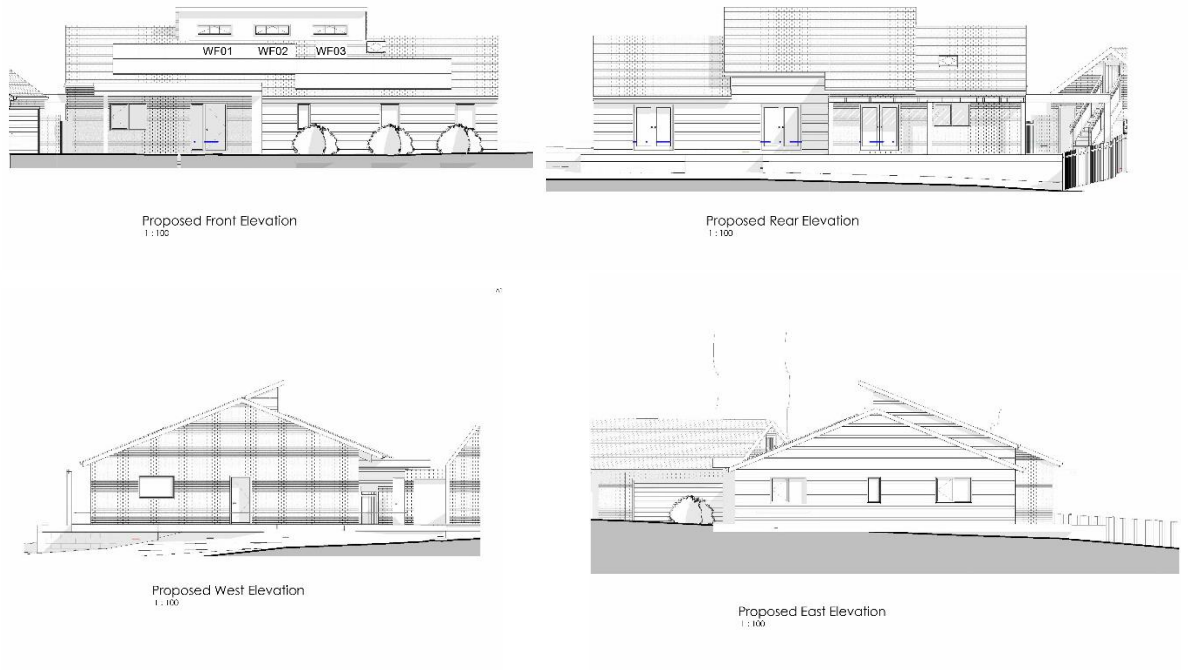
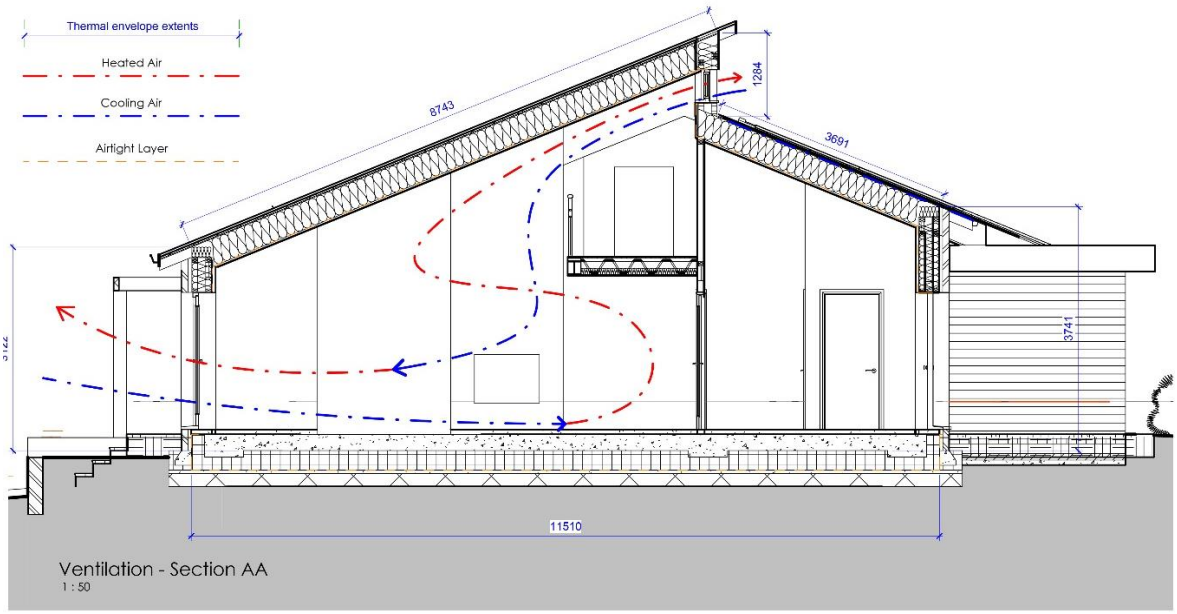
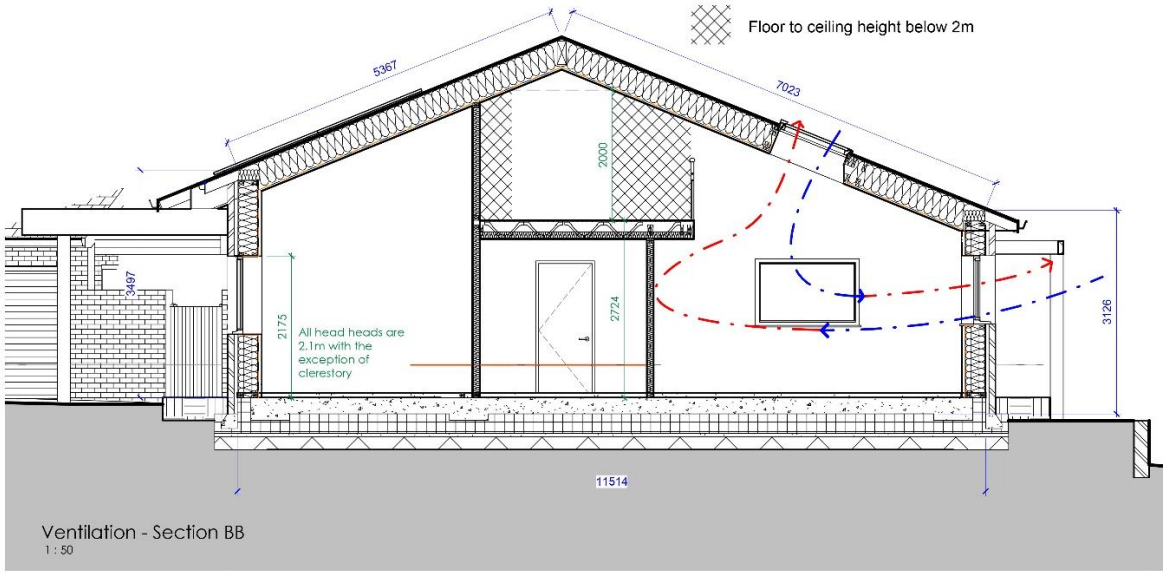


Image: Elevations of the Avery Lodge

The building is finished in a combination of brick and white-painted timber cladding. These materials were chosen not only for their durability and appearance, but also because they reflect the character of the surrounding site. Located within the curtilage of a listed building, the material palette was carefully selected to sit comfortably within the existing context and respond sensitively to the heritage setting.

2.4 Cross-section plans

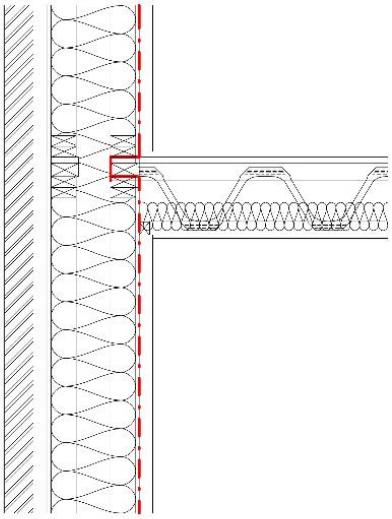




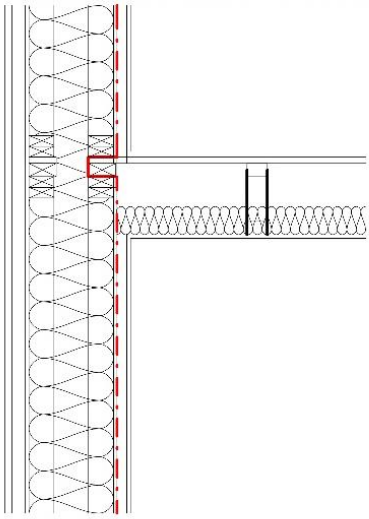
These cross sections show how the building has been carefully designed to support natural ventilation. Clerestory windows and rooflights are positioned to allow effective cross and purge ventilation, especially at night. This helps release built-up heat and reduce the risk of overheating during warmer months, supporting summer comfort without the need for mechanical cooling.

4.0 BUILDING FABRIC

4.1 External wall



IF-01 - First Floor to Wall Junction (Perpendicular)



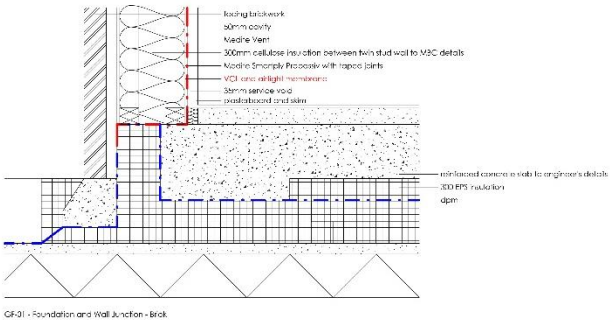
IF-02 - First Floor to Wall Junction (Parallel)

The external walls combine a mix of brick and timber cladding, giving the building a warm, natural character. Behind the cladding, the structure is built using a twin-stud timber frame, which creates enough depth to pack in 300 mm of cellulose insulation. This setup avoids thermal bridges through the wall and keeps heat in where it belongs.

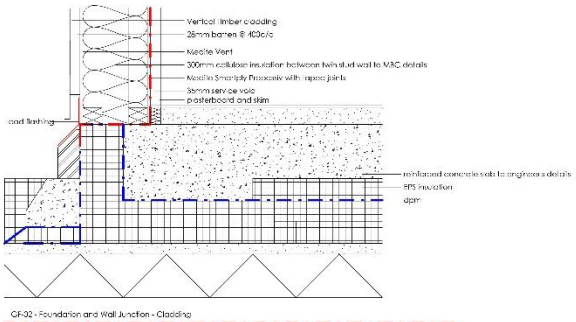
At the mezzanine level, posi-joists are used to span the space and carry loads — they also make it easier to run services without cutting through any of the airtight or insulated layers.

The airtightness layer, highlighted in red on the detail drawings, wraps right around the building. It runs continuously through all the key junctions and was carefully sealed on site to meet Passivhaus airtightness requirements.

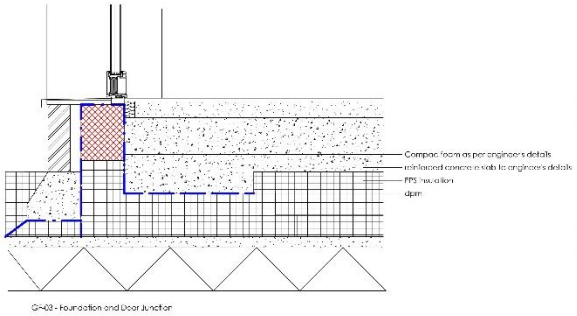
4.2 Foundations



GF-01 - Foundation and Wall Junction - Brick



GF-02 - Foundation and Wall Junction - Cladding



GF-03 - Foundation and Door Junction

THERMAL COMPONENTS

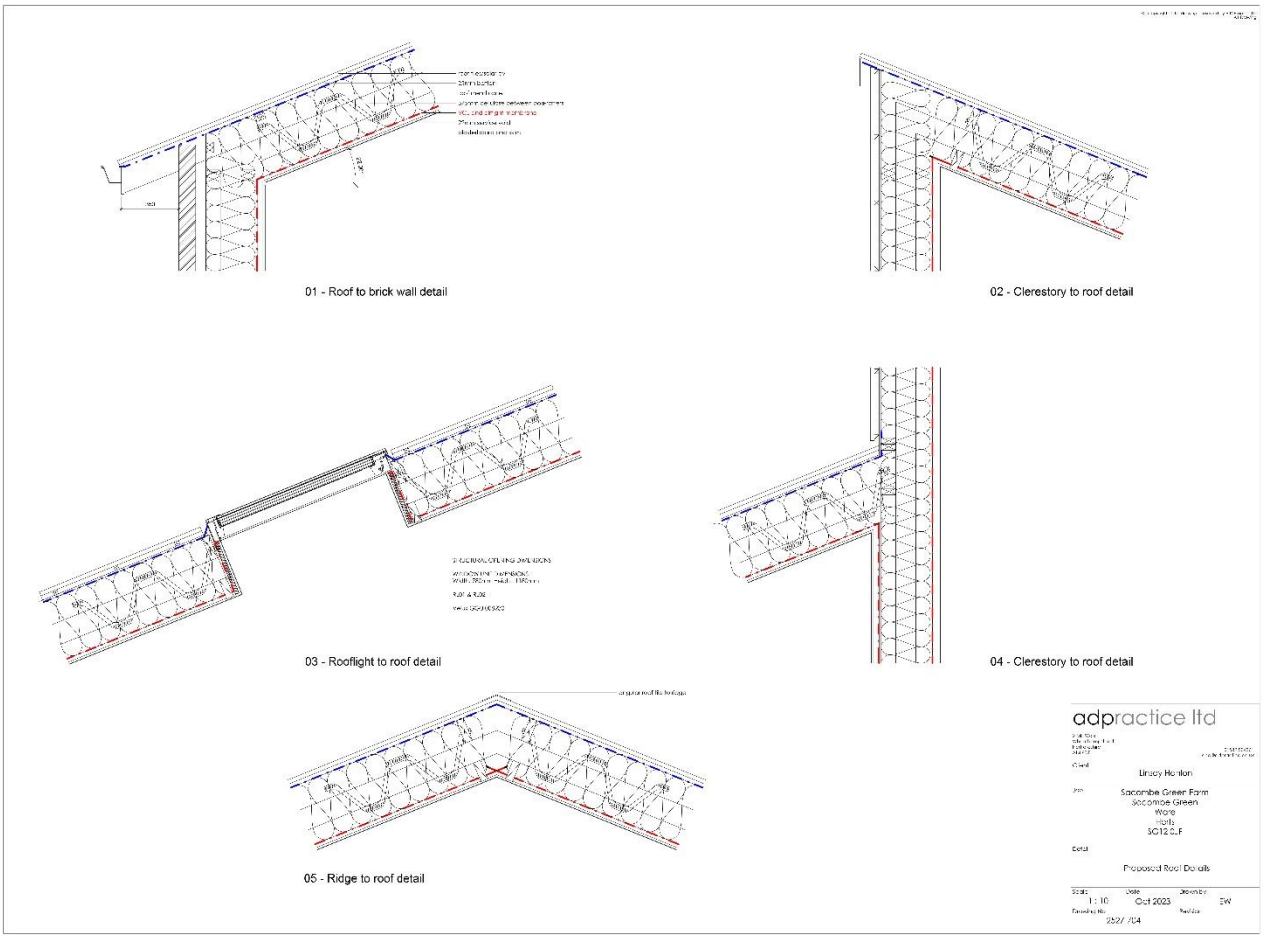
product	manufacturer	thickness(mm)	thermal conductivity(W/mK)
External Wall			
Brick		102.5	
Cavity		50	
OR			
Timber cladding		25	
Battens		47	
M&C frame			
- Meidhe Vent	M&C	12	0.1
- Warmcell / Timber Flange (90 : 10)	M&C	89	0.038 / 0.13
- Warmcell Web	M&C	122	0.038
- Warmcell / Timber Flange (90 : 10)	M&C	89	0.038 / 0.13
- Meidhe SmartPly ProProSV	M&C	13	0.1
Battens / Service Void (10 : 90)	M&C	35	0.13 / 0.38
Plasterboard		12.5	0.19
Plaster skim		3	0.35
Pitched Roof			
Slate Tiles			
OR			
Solar Panels			
M&C frame			
- Meidhe Vent	M&C	12	0.1
- Warmcell / Timber Flange (90 : 10)	M&C	147	0.038 / 0.13
- Warmcell / Timber Web (98.5 : 1.5)	M&C	131	0.038 / 0.13
- Warmcell / Timber Flange (90 : 10)	M&C	97	0.038 / 0.13
Battens / Service Void (10 : 90)	M&C	22	0.13 / 0.38
Plasterboard		12.5	0.19
Plaster skim		3	0.35
Floor			
Timber floorboards		20	0.13
M&C Concrete Slab		260	0.5
EPS Insulation		300	0.034
Windows			
Internorm HF410	Internorm		0.79 W/mK
Internorm KF410	Internorm		0.71 W/mK
Internorm AT520	Internorm		-
Rooflights			
Velux CCL 006230	Velux		0.7 W/mK

The building is constructed on a reinforced concrete raft foundation, which was selected to suit both the structural and thermal performance requirements of the site. Due to the presence of previous building foundations, the dig had to be taken deeper than usual. Ground conditions consisted of clay over gravel, with low permeability, making drainage and stability key considerations.

The concrete slab was engineered to carry the full structural load of the building, while also supporting a thermal bridge–free design. High-performance insulation wraps continuously beneath and around the slab, ensuring a full thermal break between the structure and the ground.

This insulation layer connects seamlessly with the wall insulation to maintain a continuous, unbroken thermal envelope. The slab also serves as the airtight layer at ground level, supporting the building's overall airtightness strategy.

4.3 Roof



The roof is designed with a continuous layer of insulation, uninterrupted by thermal bridges. It uses a posi-joist system to provide structural support while allowing services to run within the insulation zone, avoiding penetrations through the airtight or thermal layers.

This approach ensures that insulation wraps fully across the ceiling and up to the ridge, maintaining thermal continuity throughout.

4.4 Thermal bridges

Thermal bridges were carefully minimised throughout the design using sufficient and continuous insulation to interrupt heat transfer through conductive materials like concrete, metal, and ground contact areas.

A concrete raft foundation was used, detailed with a generous layer of insulation beneath and around the slab to create an effective thermal break between the ground and the finished floor level.

The building envelope is wrapped in 300 mm of blown-in insulation to the walls and roof, creating a continuous, uninterrupted insulation layer. Rooflights are fully wrapped in insulation on all sides to maintain this continuity, and Velux GGU 008230 were specified to reduce losses even further.

Window junctions were also carefully detailed to reduce thermal bridging — these are shown later in the report.

5 WINDOW COMPONENTS

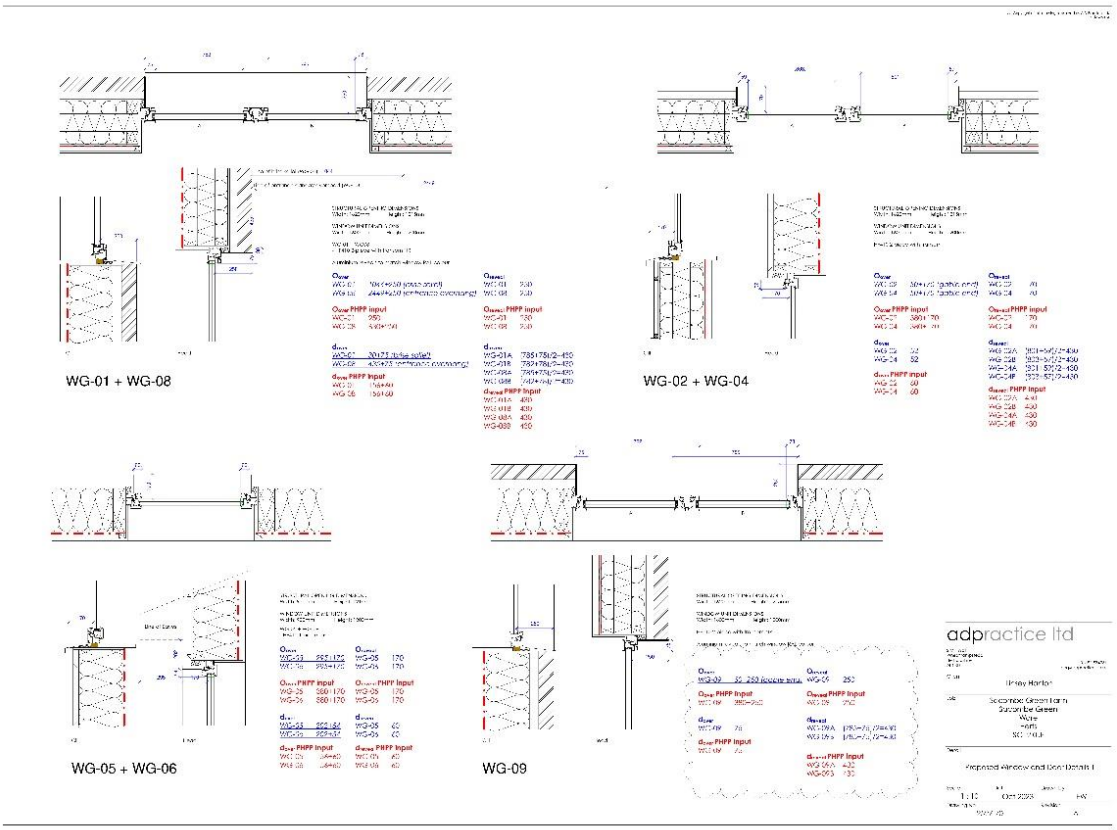
5.1 Window schedule

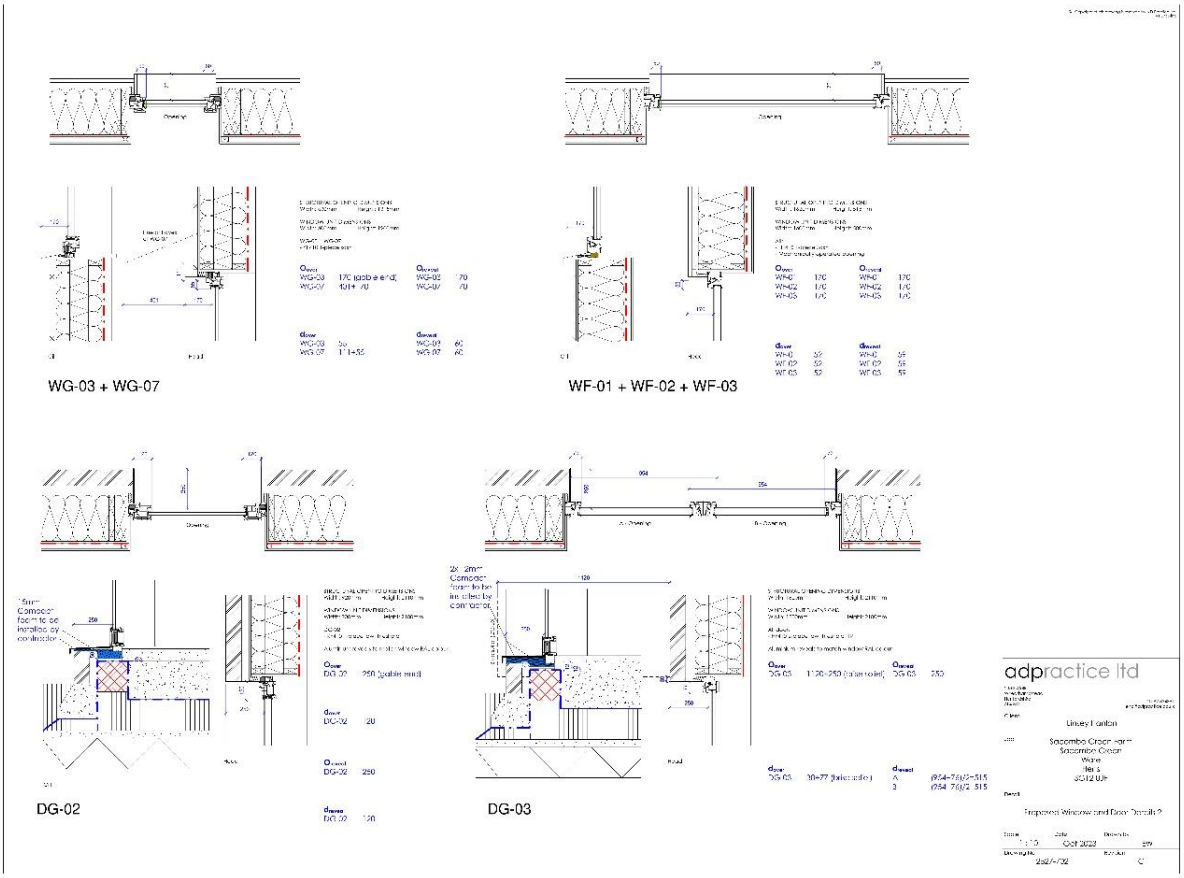
The project uses a consistent palette of high-performance glazing throughout. All windows and external doors are Internorm HF410 or KF410 composite units, combining timber interiors with aluminium cladding. Triple-glazed Velux GGU 008230 rooflights are installed over the mezzanine. Windows are a mix of fixed and tilt-and-turn units, with sizes and placements carefully chosen to balance daylight, ventilation, and thermal performance.

Quan-tity	Description	Deviation from north	Angle of inclination from the horizontal	Orien- tation	Width	Height	Selection from 'Areas' worksheet	Selection from 'Components' worksheet	Selection from 'Components' worksheet	Perpen-dicular radiation	Glazing	Frames (avg.)	$\Psi_{Glazing\ edge}$ (Avg.)	left	right	bottom	top	$\Psi_{Installation}$ (Avg.)	Window Area	Glazing area	U_w installed	Glazed fraction per window	Ex
		-	-		m	m		1-Sorting: LIKE LIST	1-Sorting: LIKE LIST	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 90				W/(mK)	m²	m²	W/(m²K)	%	
1	WG-01 A (Opening)	346.54	90	North	0.790	1.005	15-North (Rear) Elevation - Peach Brick	01ud-HF410 Glazing	05ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass - operable right	0.56	0.60	0.86	0.040	0	1	1	1	0.040	0.8	0.45	0.98	57%	
1	WG-01 B (Opening)	346.54	90	North	0.790	1.005	15-North (Rear) Elevation - Peach Brick	01ud-HF410 Glazing	04ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass - operable left	0.56	0.60	0.86	0.040	1	0	1	1	0.040	0.8	0.45	0.98	57%	
1	WG-02A (Opening)	76.54	90	East	0.790	1.155	4-East (Right Side) Elevation - White Timber	01ud-HF410 Glazing	05ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass - operable right	0.56	0.60	0.86	0.040	0	1	1	1	0.040	0.9	0.54	0.96	59%	
1	WG-02B (Opening)	76.54	90	East	0.790	1.155	4-East (Right Side) Elevation - White Timber	01ud-HF410 Glazing	04ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass - operable left	0.56	0.60	0.86	0.040	1	0	1	1	0.040	0.9	0.54	0.96	59%	
1	WG-03 (Opening)	76.54	90	East	0.580	0.855	4-East (Right Side) Elevation - White Timber	02ud-KF410 Obscure Glazing	02ud-Internorm KF410 open NO foam ISO spacer Ug=0.5	0.00	0.50	1.10	0.033	1	1	1	1	0.040	0.5	0.21	1.20	42%	
1	WG-04 A (Opening)	76.54	90	East	0.790	1.155	4-East (Right Side) Elevation - White Timber	01ud-HF410 Glazing	05ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass - operable right	0.56	0.60	0.86	0.040	0	1	1	1	0.040	0.9	0.54	0.96	59%	
1	WG-04 B (Opening)	76.54	90	East	0.790	1.155	4-East (Right Side) Elevation - White Timber	01ud-HF410 Glazing	04ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass - operable left	0.56	0.60	0.86	0.040	1	0	1	1	0.040	0.9	0.54	0.96	59%	
1	WG-05 (Opening)	166.54	90	South	0.880	1.155	1-South (Front) Elevation - White Timber	01ud-HF410 Glazing	01ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass	0.56	0.60	0.86	0.040	1	1	1	1	0.040	1.0	0.62	0.99	61%	
1	WG-06 (Opening)	166.54	90	South	0.880	1.155	1-South (Front) Elevation - White Timber	01ud-HF410 Glazing	01ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass	0.56	0.60	0.86	0.040	1	1	1	1	0.040	1.0	0.62	0.99	61%	
1	WG-07 (Opening)	166.54	90	South	0.580	1.155	1-South (Front) Elevation - White Timber	02ud-KF410 Obscure Glazing	02ud-Internorm KF410 open NO foam ISO spacer Ug=0.5	0.00	0.50	1.10	0.033	1	1	1	1	0.040	0.7	0.32	1.15	47%	
1	WG-08A (Opening)	166.54	90	South	0.790	1.155	13-South (Front) Elevation - Peach Brick	01ud-HF410 Glazing	05ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass - operable right	0.56	0.60	0.86	0.040	0	1	1	1	0.040	0.9	0.54	0.96	59%	
1	WG-08B (Opening)	166.54	90	South	0.790	1.155	13-South (Front) Elevation - Peach Brick	01ud-HF410 Glazing	04ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass - operable left	0.56	0.60	0.86	0.040	1	0	1	1	0.040	0.9	0.54	0.96	59%	
1	WG-09A (Opening)	256.54	90	West	0.790	1.155	14-West (Left Side) Elevation - Peach Brick	01ud-HF410 Glazing	04ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass - operable left	0.56	0.60	0.86	0.040	1	0	1	1	0.040	0.9	0.54	0.96	59%	
1	WG-09B (Opening)	256.54	90	West	0.790	1.155	14-West (Left Side) Elevation - Peach Brick	01ud-HF410 Glazing	05ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass - operable right	0.56	0.60	0.86	0.040	0	1	1	1	0.040	0.9	0.54	0.96	59%	
3	WF-01,WF-02,WF-03 (fanlight)	166.54	90	South	1.600	0.500	18-South (mezzanine) - white timber	01ud-HF410 Glazing	01ud-Internorm HF410 opener ISO spacer Ug=0.6 48mm glass	0.56	0.60	0.86	0.040	1	1	1	1	0.040	2.4	1.18	1.11	49%	
1	RL-01	166.54	22	Horizontal	0.780	1.180	7-Front Roof Pitch	04ud-Velux GGU 008230	03ud-Velux GGU 008230	0.35	0.38	0.70	0.024	1	1	1	1	0.040	0.9	0.53	0.76	58%	
1	RL - 02	346.54	22	Horizontal	0.780	1.180	8-Rear Roof Pitch	04ud-Velux GGU 008230	03ud-Velux GGU 008230	0.35	0.38	0.70	0.024	1	1	1	1	0.040	0.9	0.53	0.76	58%	

All windows and doors are installed within the insulation layer using timber box frames. This approach helps to align the glazing with the centre of the thermal envelope, reducing thermal bridging and improving overall performance.

Airtightness is maintained with taped connections on both the internal and external faces. The box frames are fully insulated, and reveals are finished to minimise heat loss and eliminate cold spots. This installation method is consistent with Passivhaus best practice and supports the overall energy performance of the building.




WG-03 + WG-07
WF-01 + WF-02 + WF-03
DG-02
DG-03
adpractice ltd
Linsey Hanlon
Sacombe Green Farm
Sacombe Green
Ware
Herts
SG12 0JF
Proposed Window and Door Details 2
Oct 2023
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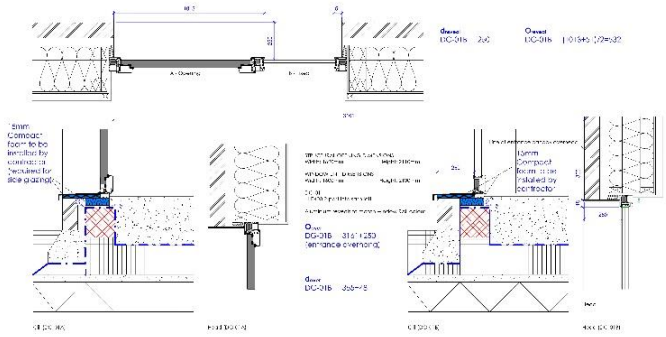
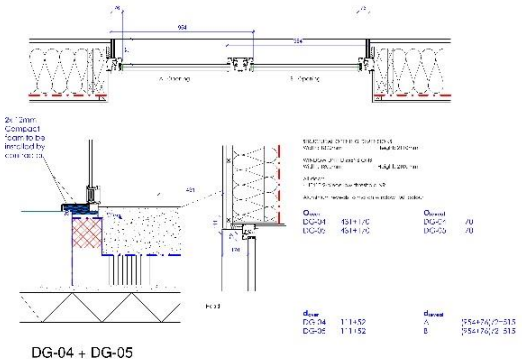

DG-01 & side glazing


DG-04 + DG-05
adpractice ltd
Linsey Hanlon
Sacombe Green Farm
Sacombe Green
Ware
Herts
SG12 0JF
Proposed Window and Door Details 3 - PLOT
Oct 2023
2527-03
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5.2 Insulated glazing units

Window frames | Heat recovery DHW

Glazing			Glazing
	Recommended glazing type to start planning: Triple thermally insulated glazing (Please consider the comfort criterion!)		
ID	Description	g-Value	U_g-Value
			W/(m²K)
01ud	HF410 Glazing	0.56	0.60
02ud	KF410 Obscure Glazing	0.00	0.50
03ud	HF410 Glazing (door)	0.55	0.60
04ud	Velux GGU 008230	0.35	0.38
05ud	KF410 Glazing (door)	0.55	0.60
06ud	HT420 Fixed	0.54	0.60
07ud	HT420 Panel	0.00	0.55
08ud			
09ud			
10ud			

Window area orientation	Global radiation (main orientations) kWh/(m²a)	Shading	Dirt	Non-vertical radiation	Glazing fraction	g-Value	Solar irradiation reduction factor	Window area m²	Window U-Value W/(m²K)	Glazing area m²	Average global radiation kWh/(m²a)		Transmission losses heating period kWh/a	Heating gains solar radiation heating period kWh/a
Standard values →	kWh/(m²a)	0.75	0.95	0.85										
North	104	0.81	0.95	0.85	0.66	0.55	0.44	12.64	0.89	8.40	109	North	791	331
East	214	0.83	0.95	0.85	0.57	0.51	0.38	4.15	0.99	2.37	181	East	288	147
South	400	0.68	0.95	0.85	0.55	0.39	0.30	10.20	1.04	5.63	392	South	749	471
West	232	0.75	0.95	0.85	0.62	0.55	0.38	3.65	0.98	2.26	268	West	250	204
Horizontal	337	0.75	0.95	0.85	0.58	0.35	0.35	1.84	0.76	1.07	335	Horizontal	99	76
Total or average value for all windows.						0.49	0.38	32.47	0.95	19.72			2178	1229

All glazing is triple-glazed, with a centre-pane U-value of around 0.60 W/m²K. The g-value is roughly 0.50 to help reduce summer heat gains while still allowing useful winter solar gain.

5.3 Window frames

Glazing Heat recovery DHW

Window frames **Window frames**

ID	Description	U-Value				Frame width				Glazing edge thermal bridge				Installation thermal bridge				Curtain wall facades:
		left	right	bottom	above	left	right	bottom	above	$\Psi_{Glazing\ edge}$ left	$\Psi_{Glazing\ edge}$ right	$\Psi_{Glazing\ edge}$ bottom	$\Psi_{Glazing\ edge}$ top	$\Psi_{Installation}$ left	$\Psi_{Installation}$ right	$\Psi_{Installation}$ bottom	$\Psi_{Installation}$ top	χ_{Gl} -value Glass carrier
		W/(m²K)	W/(m²K)	W/(m²K)	W/(m²K)	m	m	m	m	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/K
01ud	Internorm HF410 opener ISO spacer Ug=0,6 48mm glass	0.86	0.86	0.86	0.86	0.108	0.108	0.108	0.108	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	
02ud	Internorm KF410 open NO foam ISO spacer Ug=0,5	1.10	1.10	1.10	1.10	0.114	0.114	0.144	0.114	0.033	0.033	0.033	0.033	0.040	0.040	0.040	0.040	
03ud	Velux GGU 008230	0.73	0.73	0.71	0.61	0.106	0.106	0.123	0.116	0.025	0.025	0.019	0.025	0.040	0.040	0.040	0.040	
04ud	Internorm HF410 opener ISO spacer Ug=0,6 48mm glass - operable left	0.86	0.86	0.86	0.86	0.108	0.108	0.108	0.108	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	
05ud	Internorm HF410 opener ISO spacer Ug=0,6 48mm glass - operable right	0.86	0.86	0.86	0.86	0.108	0.108	0.108	0.108	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	
06ud																		
07ud																		
08ud	Internorm HT400 door (panel) NO - site panel	1.17	1.17	2.00	1.17	0.162	0.162	0.123	0.162	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	
09ud	Internorm HT400 side glass panel Ug=0,6	1.17	1.17	2.00	1.17	0.081	0.173	0.125	0.081	0.038	0.038	0.038	0.038	0.040	0.040	0.040	0.040	
10ud																		

Frames have U-values between 1.0 and 1.2 W/m²K. With careful installation and minimal thermal bridging, the average installed window U-value comes in at around 0.75 W/m²K. The timber-aluminium construction balances thermal performance with low maintenance and good durability.

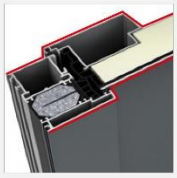
5.4 Window installation

The windows were installed after the timber frame was erected. Windows are installed within the insulation layer using airtight tapes and insulated reveals. Details were developed using Passivhaus-certified guidance to limit thermal bridging at junctions. Installation psi-values were entered into PHPP based on manufacturer and detailing data.

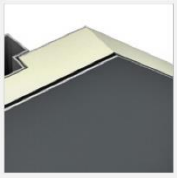
Internorm

AT 520 ALUMINIUM ENTRANCE DOOR

Thermal insulation	U_D as low as 0.80 W/(m²K)
Noise reduction	up to 32 dB
Security	up to RC2
Locking	Multi-point locking
Construction depth	93 mm



Round edge on inside, square edge on outside



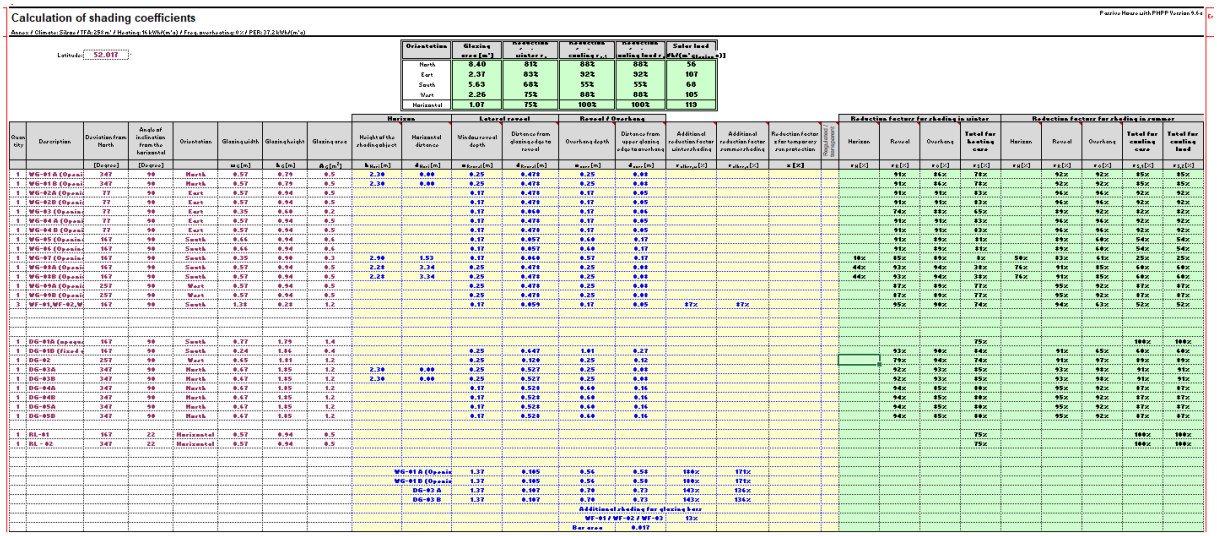
Cavity-filled structure with expansion insert for thermal stability

5-lever locking as standard for highest security

1	DG-01A (opaque door)	166.54	90	South	1.090	2.070	13-South (Front) Elevation - Peach	07ud-AT520 Panel	08ud-Internorm HT400 door (panel) NO - site	0.00	0.55	1.30	0.040	0	1	1	1	0.040	2.3	1.37	1.01	61%
1	DG-01B (fixed glazed)	166.54	90	South	0.490	2.070	13-South (Front) Elevation - Peach	06ud-AT520 Fixed	09ud-Internorm HT400 side glass panel Ug=0,6	0.54	0.60	1.26	0.038	0.01	0	0.025	0.01	0.012	1.0	0.44	1.17	43%
1	DG-02	256.54	90	West	0.880	2.070	14-West (Left Side) Elevation - Peach	05ud-KF410 Glazing (door)	02ud-Internorm KF410 open NO foam ISO	0.55	0.60	1.10	0.033	1	1	1	1	0.040	1.8	1.18	0.99	65%
1	DG-03A	346.54	90	North	0.890	2.070	15-North (Rear) Elevation - Peach Brick	03ud-HF410 Glazing (door)	05ud-Internorm HF410 opener ISO spacer Ug=0,6 48mm glass -	0.55	0.60	0.86	0.040	0	1	1	1	0.040	1.8	1.25	0.88	68%
1	DG-03B	346.54	90	North	0.890	2.070	15-North (Rear) Elevation - Peach Brick	03ud-HF410 Glazing (door)	04ud-Internorm HF410 opener ISO spacer Ug=0,6 48mm glass -	0.55	0.60	0.86	0.040	1	0	1	1	0.040	1.8	1.25	0.88	68%
1	DG-04A	346.54	90	North	0.890	2.070	3-North (Rear) Elevation - White Timber	03ud-HF410 Glazing (door)	05ud-Internorm HF410 opener ISO spacer Ug=0,6 48mm glass -	0.55	0.60	0.86	0.040	0	1	1	1	0.040	1.8	1.25	0.88	68%
1	DG-04B	346.54	90	North	0.890	2.070	3-North (Rear) Elevation - White Timber	03ud-HF410 Glazing (door)	04ud-Internorm HF410 opener ISO spacer Ug=0,6 48mm glass -	0.55	0.60	0.86	0.040	1	0	1	1	0.040	1.8	1.25	0.88	68%
1	DG-05A	346.54	90	North	0.890	2.070	3-North (Rear) Elevation - White Timber	03ud-HF410 Glazing (door)	05ud-Internorm HF410 opener ISO spacer Ug=0,6 48mm glass -	0.55	0.60	0.86	0.040	0	1	1	1	0.040	1.8	1.25	0.88	68%
1	DG-05B	346.54	90	North	0.890	2.070	3-North (Rear) Elevation - White Timber	03ud-HF410 Glazing (door)	04ud-Internorm HF410 opener ISO spacer Ug=0,6 48mm glass -	0.55	0.60	0.86	0.040	1	0	1	1	0.040	1.8	1.25	0.88	68%
1	RL-01	166.54	22	Horizontal	0.780	1.180	7-Front Roof Pitch	04ud-Velux GGU 008230	03ud-Velux GGU 008230	0.35	0.38	0.70	0.024	1	1	1	1	0.040	0.9	0.53	0.76	58%
1	RL - 02	346.54	22	Horizontal	0.780	1.180	8-Rear Roof Pitch	04ud-Velux GGU 008230	03ud-Velux GGU 008230	0.35	0.38	0.70	0.024	1	1	1	1	0.040	0.9	0.53	0.76	58%

Entrance and external doors are from the Internorm KF410 range, thermally matched to the windows and using the same glazing units. Doors are fully airtight and offer similar thermal performance to the adjacent windows.

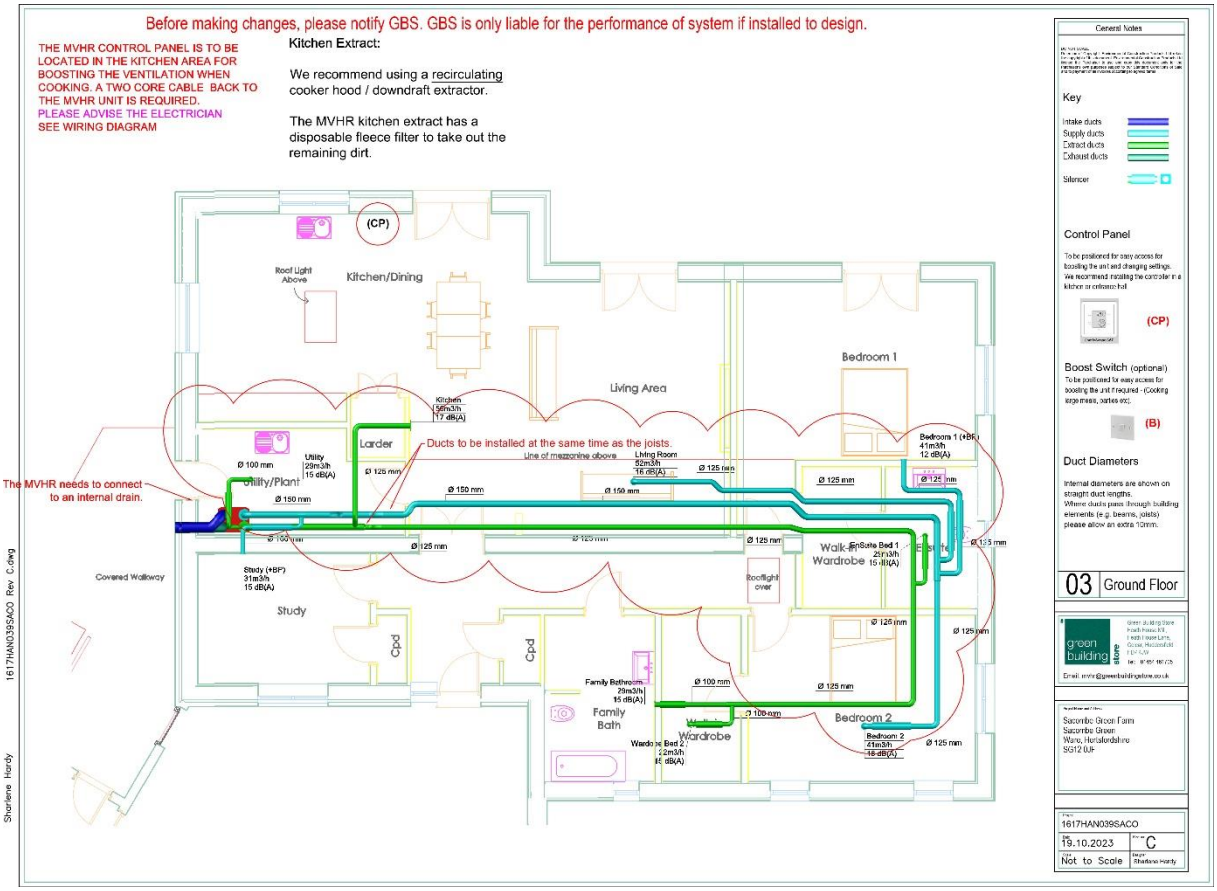
5.5 Solar protection



Solar gain is managed through a combination of moderate solar control glazing and the generous eaves overhang on the south side of the building. This overhang naturally shades windows from high-angle summer sun, helping to reduce overheating while still allowing valuable solar gain during the winter. The window layout and glazing specification were chosen to strike a balance between daylight, warmth, and comfort all year round.

6 BUILDING SERVICES

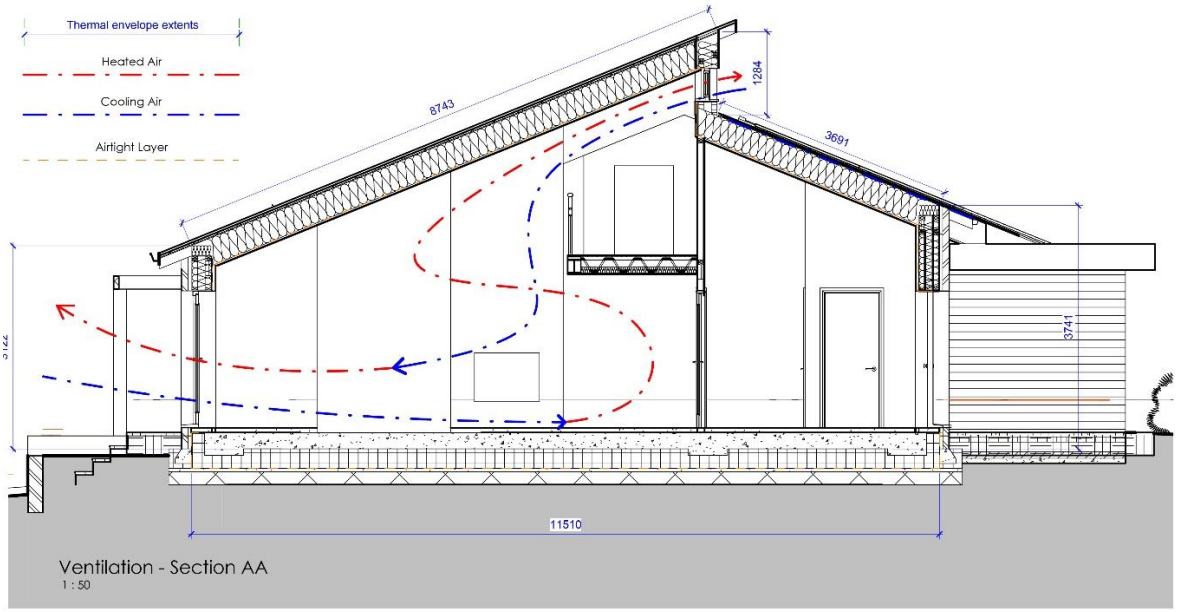
6.1 Mechanical ventilation



Ventilation is handled by a Zehnder ComfoAir Q350 MVHR unit, which provides fresh air to living and sleeping areas and extracts from kitchens and bathrooms. The system has over 88% heat recovery efficiency and a low specific fan power of 0.45 W/(m³/h). A duct-mounted pre-heater protects the unit in cold weather.

The ductwork is compact and simple, running mostly in the ceiling void, with one riser to the mezzanine. The system was balanced on commissioning, and airflows were confirmed to be both effective and quiet.

6.2 Summer ventilation and overheating risk



Overheating is managed using natural ventilation and passive design. Operable windows on both the ground floor and mezzanine allow for effective cross-ventilation and stack effect cooling at night.

The design incorporates a deep eaves overhang that provides solar protection to south-facing windows during summer months. Combined with moderate g-value glazing and thoughtful window layout, this keeps internal temperatures comfortable.

PHPP modelling confirms that less than 1% of the year exceeds 25°C, keeping the design well within Passivhaus limits for summer comfort.

6.3 Heating generation and distribution

Space heating is provided by a NIBE F2040-6 air-source heat pump, which runs at low temperatures for efficiency. Heat is delivered via underfloor heating in the main living spaces and electric towel radiators in bathrooms. The mezzanine doesn't require its own heating, as warm air naturally circulates upward.

The ASHP is installed externally, with insulated pipework running into the thermal envelope. It provides consistent heat even in low outdoor temperatures and is well-matched to the building's very low heating demand.

6.4 DHW

The same NIBE unit supplies hot water via a 200 L hot water cylinder, located inside the thermal envelope. Distribution losses are minimised through short, insulated pipe runs. Fixtures are water-efficient throughout, with flow restrictors on taps and showers.

6.5 PV Generation

A total of 27 solar panels (4.0 kWp system) are mounted on the south-facing roof at 35°, with no shading. Annual generation is expected to be around 3,800 kWh, based on PHPP.

Surplus electricity is used to pre-heat hot water via an immersion diverter. The system reduces reliance on grid electricity, contributes to meeting the Primary Energy Renewable (PER) target, and allows for battery storage in the future if needed.

7 CONSTRUCTION PHASE

7.1 Images Insulation

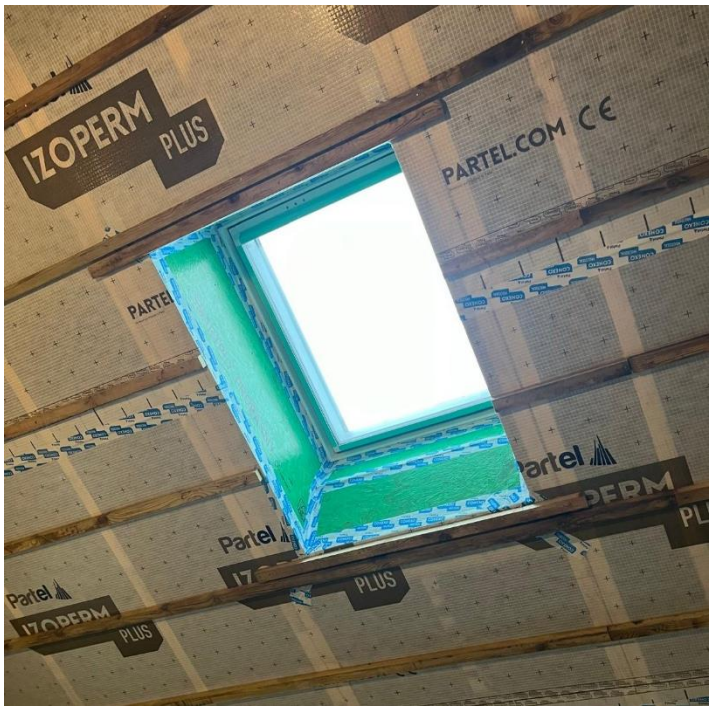
Image 1: Insulated raft foundation and insulated plinth.
Image 2: Shows the insulated plinth for the with concrete toe foundation to support brick the brick cladding above.

7.2 Images airtightness

Airtightness tape has been used throughout.

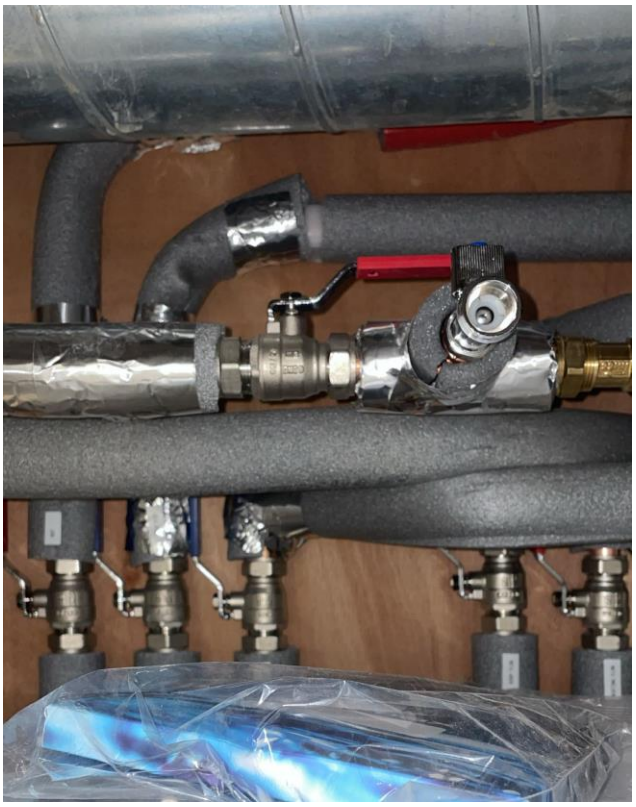
7.3 Images thermal bridges

7.4 Images window installation



7.5 Images mechanical ventilation

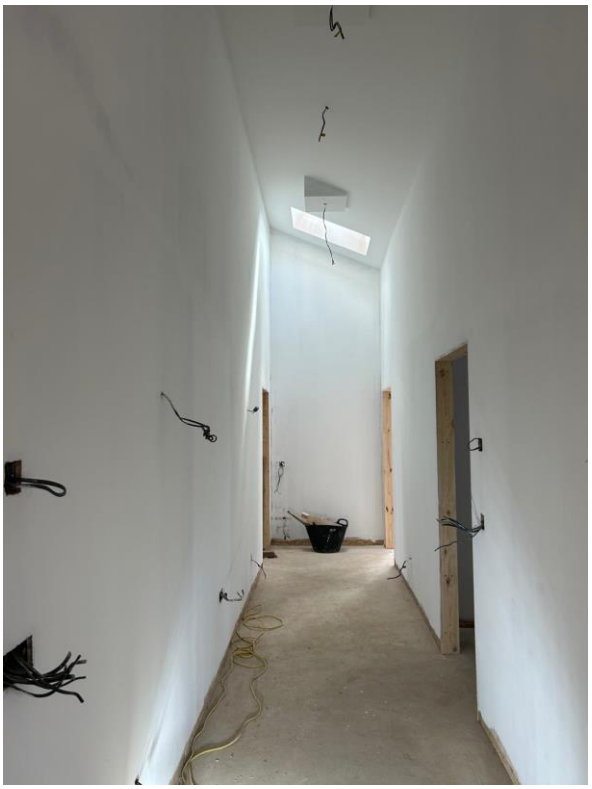
7.6 Images heating and DHW



7.7 Images cooling / summer strategies

Large overhanging eaves

Opening clearstory windows to create cross ventilation



Purge and night time ventilation through rooflights and clearstory window.

7.8 Blowerdoor test result

Air Leakage Test Report

In compliance with ATTMA TSL1 and TSL2

INSERT COMPANY LOGO

Ashby Energy Assessors

Building Address:	Sacombe Green Farm Sacombe Green Ware, Hertfordshire England SG12 0JF
Performed for:	Ashley Hazelden
Performed by:	Anthony Howitt
Test date:	25/11/2024
Associated Test file:	ADPR 6500 Sacombe Green Farm 1 - 25-11-24
Report Number:	ADPR 6774
Unique Property ID Number:	

Summary

retrotec FanTestic	version: 5.15.86	licensed to: Ashby Energy Assessors
Test date: 25/11/2024	By: Anthony Howitt	
Customer:	Ashley Hazelden	
Building Lot Number:		
Building address:	Sacombe Green Farm Sacombe Green Ware, Hertfordshire England SG12 0JF	

Building and Test Information	
Test file name:	ADPR 6500 Sacombe Green Farm 1 - 25-11-24
Building volume [m³]:	663.9
Envelope Area [m²]:	606.4
Floor Area [m²]:	198

Results	
Air flow at 50 Pa, Q_{50} [m³/h]	374.55
Air changes, n_{50}	0.56
Equivalent leakage area at 50 Pa [cm²]	21.86
Permeability at 50 Pa [m³/h/m²]	0.6177

Compliance

If you are not happy with my service, please contact me: Anthony Howitt.

A Howitt 26th November 2024

11/26/2024

7.9 Ventilation commissioning

				Design Figures						Commissioning Figures						System Type			
				Provisional						Measured						Rigid	Air valve Typ		
	Extract			Fan Speed 1		Fan Speed 2		Fan Speed 3		Fan Speed 1		Fan Speed 2		Fan Speed 3		Guideline Duct Dia (mm)	Air Valve Diameter	Air Valve Setting	Door Air Transfer Gap
Room Type	Part F Min boost	Extract	Extract Speed 2	Supply	Extract	Supply	Extract	Supply	Extract	Supply	Extract	Supply	Extract	Supply	Extract	from Air Speed at air valves & AHU:	mm	mm / %	Below Internal Doors
		101%	100%	70%		100%		130%		70%		100%		130%		1.2 m/s			(mm)
Level: Ground Floor																			
Kitchen	55	56	56		39		56		72		39		56		73	150	125	X	ND
Utility / plant	29	29	29		20		29		38		20		29		38	100	100	-5	10
Bed 1 EnSuite	29	29	29		20		29		38		20		29		38	100	100	12	10
Bed 2 wardrobe	22	22	22		16		22		29		15		22		29	100	100	20	10
Family bathroom	29	29	29		20		29		38		20		29		38	100	100	24	10
Study				22		31		40		22		31		40		100	100	8	10
Living area				36		52		67		36		52		68		125	125	19	10
Bedroom 1				29		41		54		29		41		53		125	125	x	10
Bedroom 2				29		41		54		29		41		53		125	125	7	10
Totals:	164	166	166	116	116	166	166	215	215	116	116	165	165	215	215	150			

Building Regulations - Part F
imum High Rate Extract Requireme
kitchen
utility
bathroom
wc

Fan Speed 2

Zehnder ComfoAir Q 350 Commissioning Settings

Installer Settings		Airflow Settings / Flows							
Comfort Temperature Setting	23 Deg C	Absent Fanspeed		Fanspeed 1		Fanspeed 2		Fanspeed 3	
Filter Change Warning Period	26 Weeks	Supply	Extract	Supply	Extract	Supply	Extract	Supply	Extract
Fan Speed Control Parameter (m3/h)		N/A	N/A	116	116	166	166	215	215
Fan Speed Percentage		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Externals (m3/h)					
Intake	Exhaust	Intake	Exhaust	Intake	Exhaust

If not macro enabled, go to sheet 'Unit

ZEHN_CA Q_CS

To macro enable a workbook, right click on file in

7.10 Construction cost

Approx. £850k, therefore around £3,000 per sqm.

Report produced by Emma Warren
St Albans, 10.06.2025