

Project Documentation

Gebäude-Dokumentation



1 Abstract



Apartment block with four units at 67 Witch Hazel Road, Bristol BS130QG

1.1 Data of building

Year of construction/ Baujahr	2016		
U-value external wall	0.122 W/(m2K)	Space heating	13.01 kWh/(m2a)
U-value floor	0.141 W/(m2K)	Primary Energy Renewable (PER)	0 kWh/(m2a)
U-value roof	0.098 W/(m2K)	Generation of renewable energy	0 kWh/(m2a)
U-value window	0.9 W/(m2K)	Non-renewable Primary Energy (PE)	100 kWh/(m2a)
Heat recovery	86.5 %	Pressure test n ₅₀	0.6 h-1
Special features			

1.2 Brief Description

The scheme is for 4No. 1 bedroom apartments. The block is a compact 2 storey building with independent access to all apartments and no communal accommodation. The apartments are designed to meet the minimum social housing area requirements of the housing association. The block has been designed to ensure the main living spaces and bedrooms take advantage of large south facing windows whilst the bathroom and kitchen are located to the north side and where the services requirements can be close together.

1.3 Responsible project participants / Verantwortliche Projektbeteiligte

- Architect: Quattro Design Architects
- Building systems: Greenwood Airvac
- Construction management: Speller Metcalf
- Certifying body: WARM: Low Energy Building Practice
- Passivhaus database ID: 6414
- Author of project documentation: Jim Hayles, Quattro Design Architects
- Date, Signature/

2 Views of the Passive House



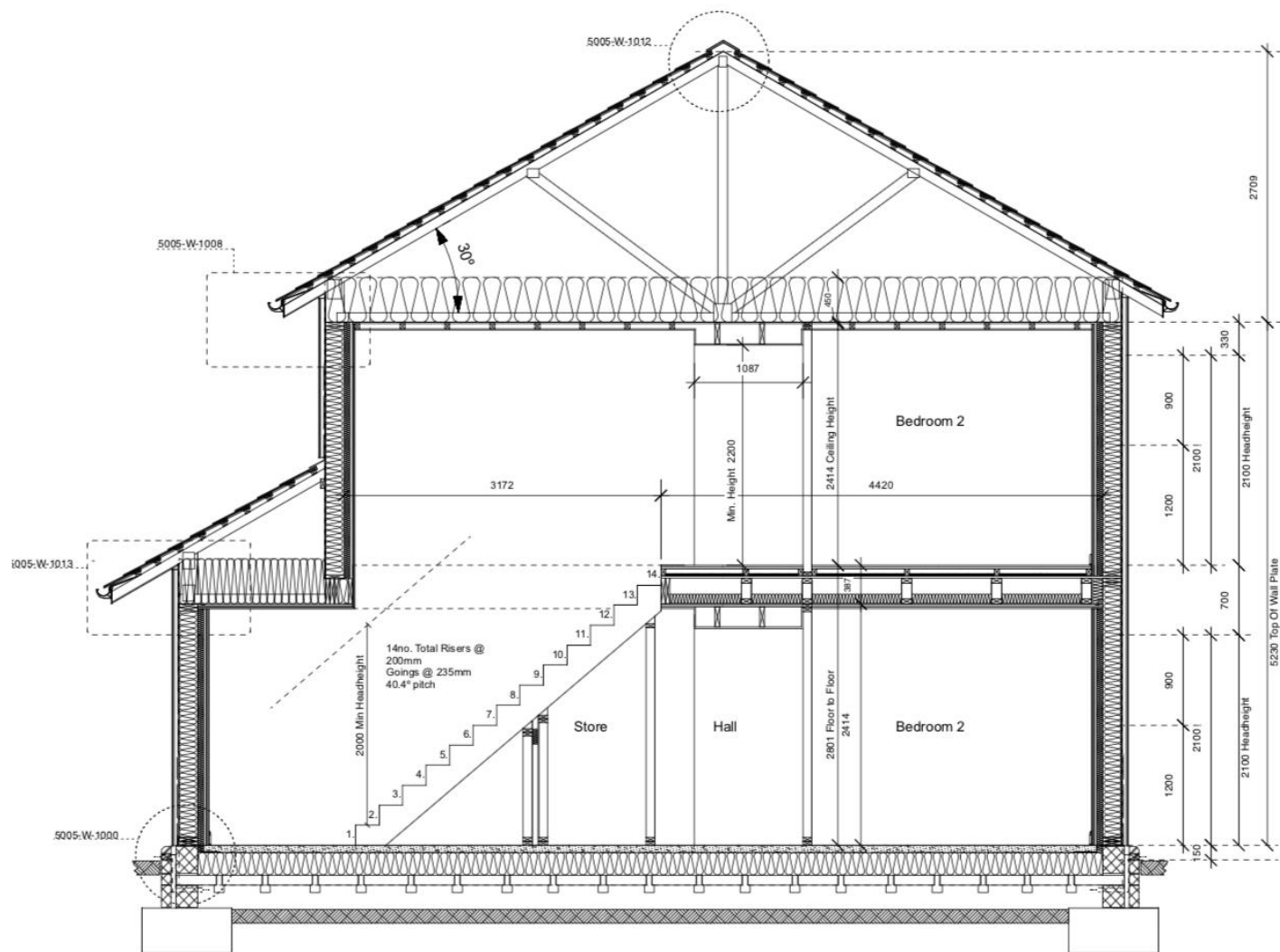
Front View



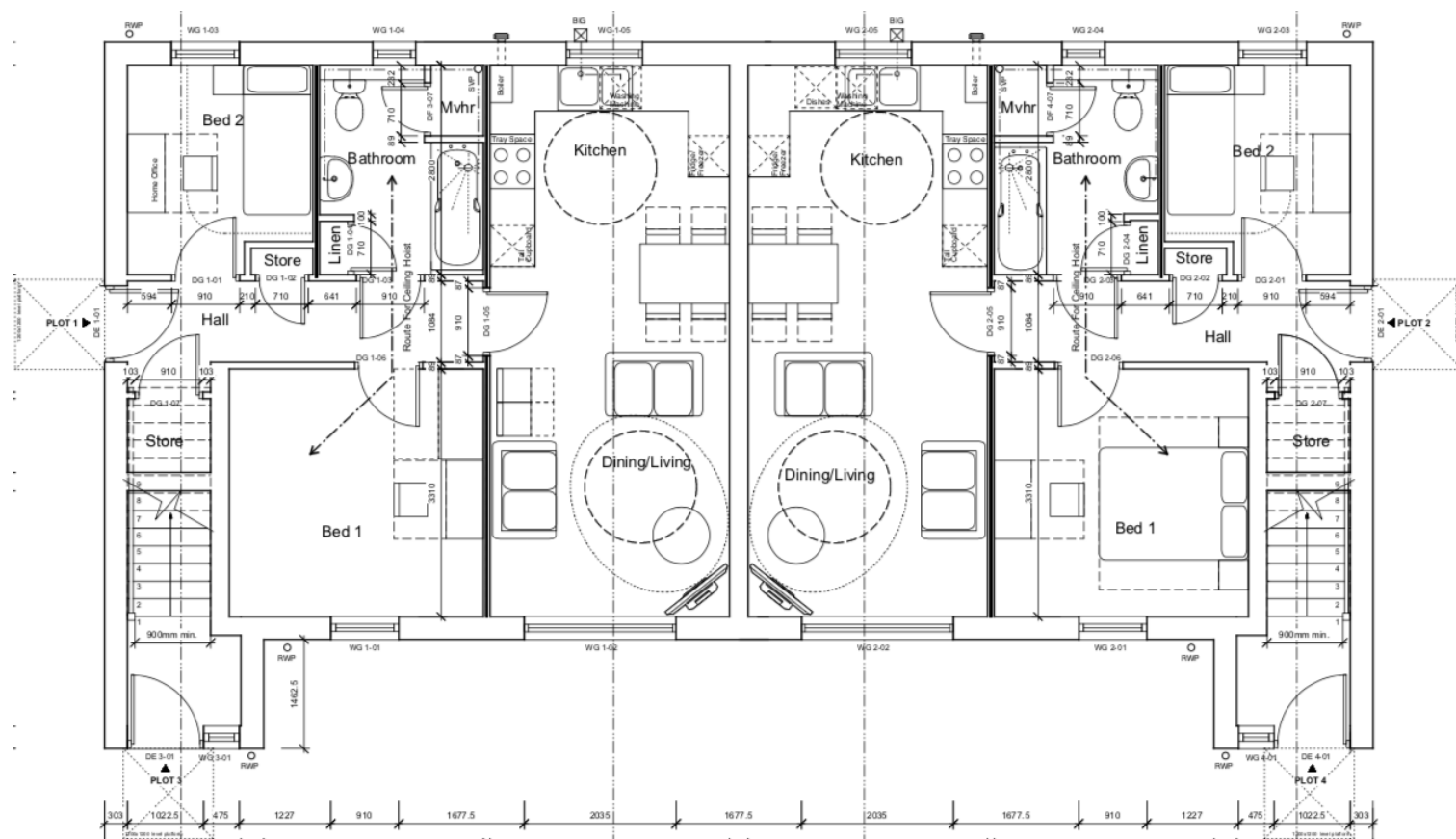
Back View



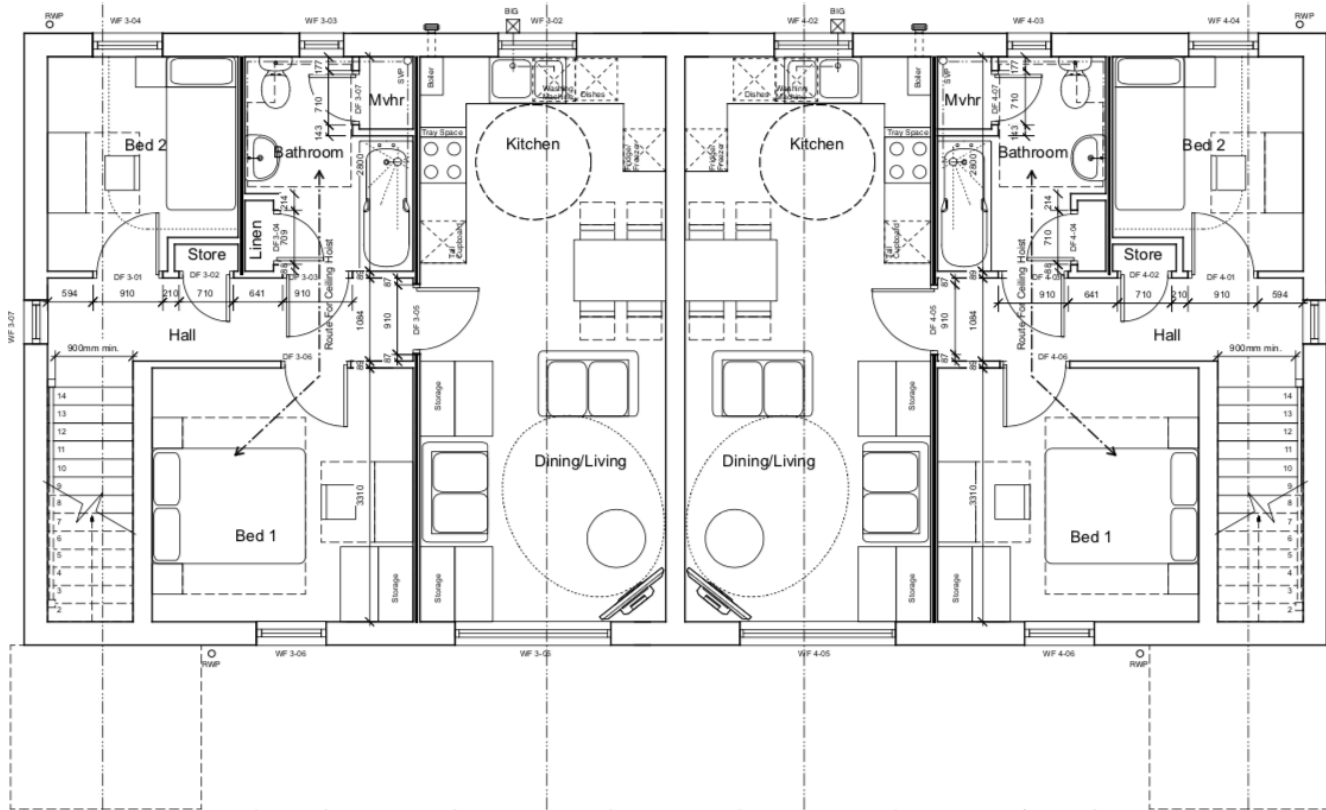
Side View



Section



Ground Floor



First Floor

5 Construction details of the envelope and Passive House technology .

The scheme was part of a larger housing scheme being built to conventional standards. The contractor was keen to use the same construction methods where possible and this led to a fairly conventional timber frame solution with a Beam and Block floor with EPS insulation. To meet the Passive House requirements enhancements were made including:

- The use of thermal blocks around the ground floor.
- Increased thickness of EPS insulation above the beam and block floor.
- Additional insulation to the inside of the timber framing with the airtight barrier protected behind.
- A significantly higher eaves to avoid reducing the insulation at the top of the wall.

5.1

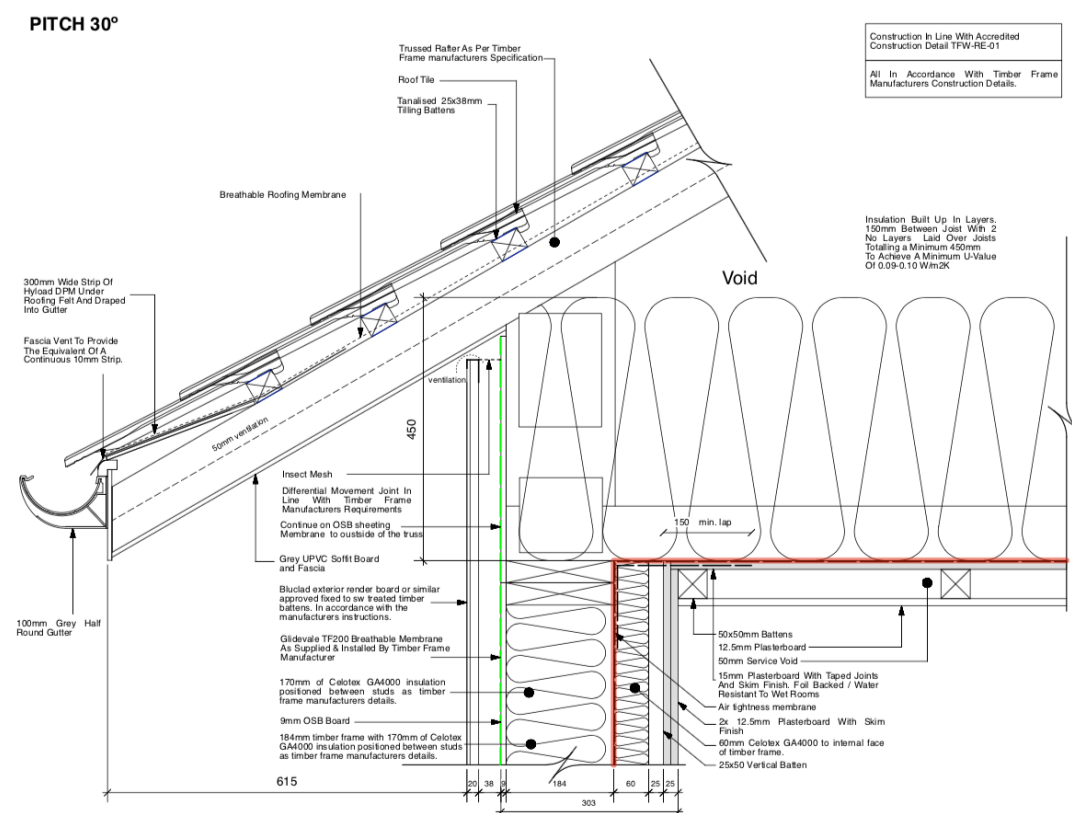
Roof:

Roof Build-up:-	13mm Plasterboard 50mm Service void 13mm Plasterboard 450mm minerwool Insulation with 15% timber U-value = 0.091W/(m2K)
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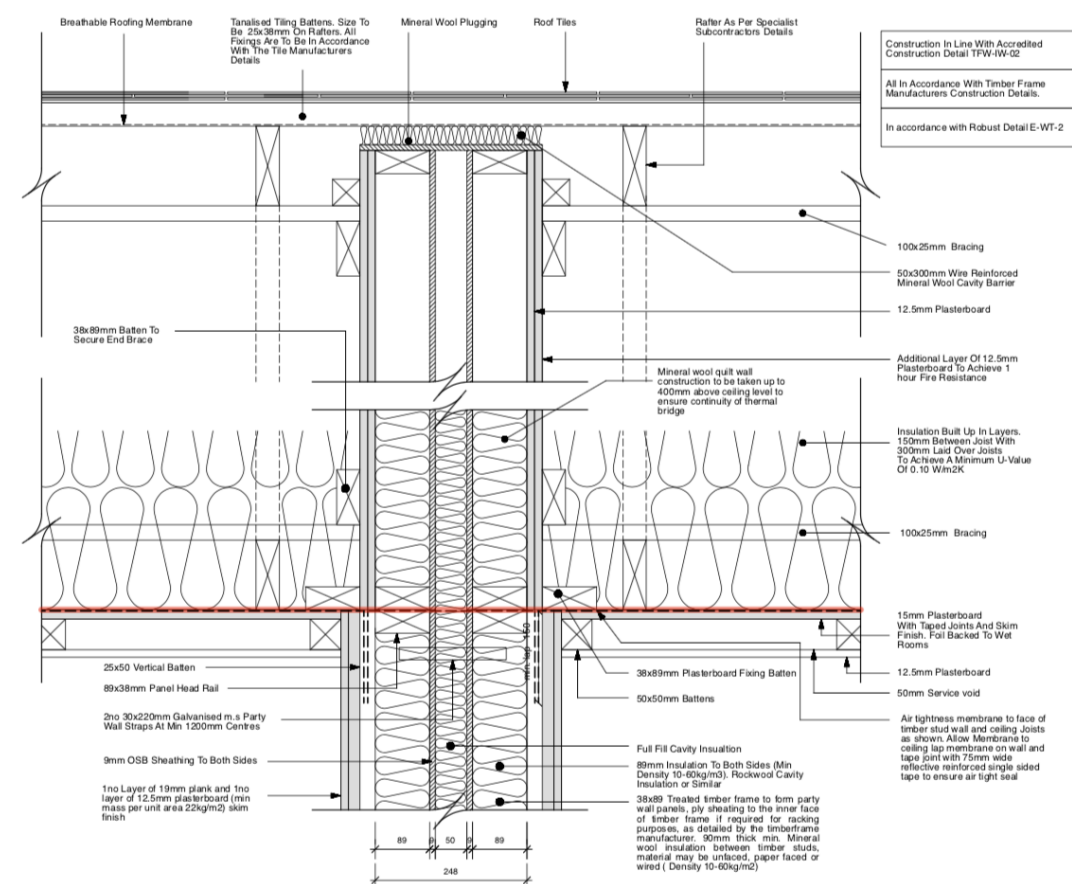
A glass minerwool loft insulation is used and is laid between and across the tops of the rafters. The height of the eaves means that there is no reduction of the 450mm insulation around the perimeter of the roof.

The insulated stud frame walls, allow the wall insulation to fully overlap the roof insulation layer at the eaves, verges and the internal party walls avoiding any cold bridging that would need to be considered with masonry loadbearing construction.

The finished plasterboard ceiling is fixed to battens that provide a service void beneath the airtightness line to the underside of the roof trusses



Eaves detail.



Party wall / roof detail
(Timber wall studs insulated in same locations at Verges)

5.2

Walls:

A standard timber frame solution was being used for non-passive house buildings within the development and the contractor was keen to keep construction as similar as possible. The wall construction was as follows; external render board, ventilation gap on breather membrane and OSB sheathing fixed to the outside of the timber frame studs. The timber framing was enhanced with additional internal PIR insulation.

The finished plasterboard linings are fixed to battens that provide a service void inside of the airtightness provided by a vapour control layer fixed to the inside face of the timber studs.

Rigid PIR insulation was used between timber studs and to the inside face of internal studs to provide the necessary u-values whilst keeping wall thicknesses reasonably thin.

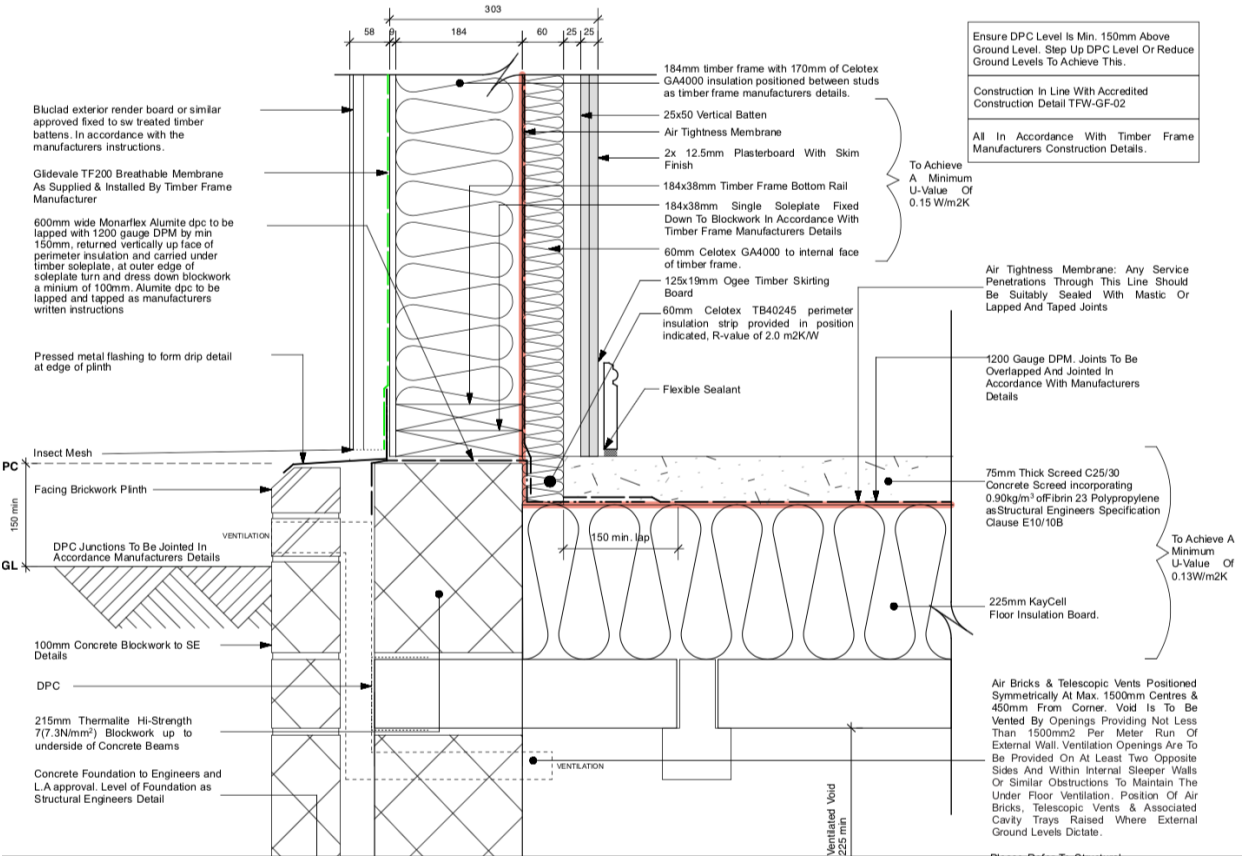
Wall Build-up:-	25mm Plasterboard 25mm Service void 60mm PIR insulation 150mm PIR Insulation with 16% timber OSB U-value = 0.123W/(m2K)
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5.3

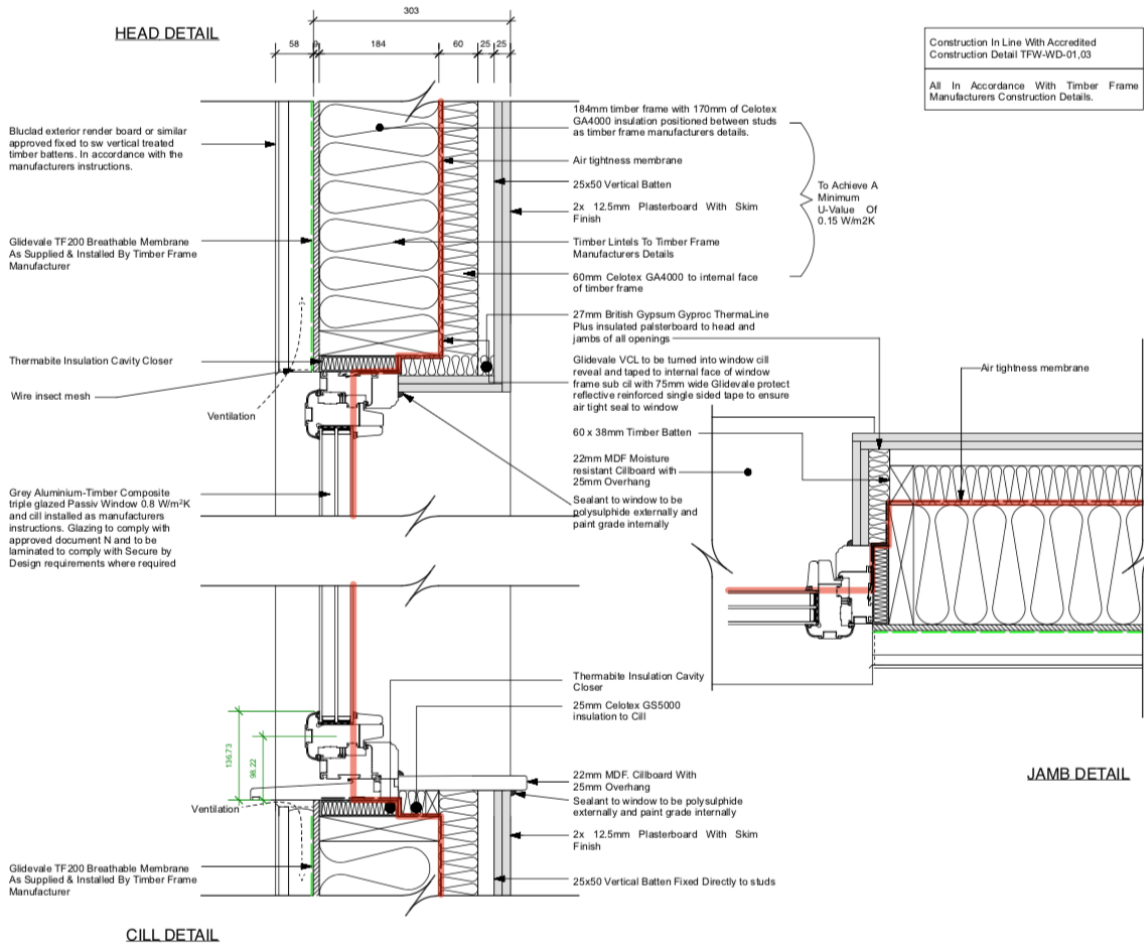
Ground Floor:

Based on the standard timber frame solution being used for the non-passive house buildings but with additional insulation. Enhanced with themalite blocks below the base plate and achieves 0.11 Y W/(mK) psi value. For a passive house this is relatively poor and compensated for by the overall design.

Floor Build-up:-	75mm Screed 255mm EPS Insulation 150mm concrete U-value = 0.123W/(m2K)
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Ground level detail.



Window detail.

5.4 Windows:

The windows used are passive house certified Munster EcoClad 120+. These are timber window frame, rain protected by exterior aluminium cladding. Insulated by polyurethane foam (0,030 W/(mK)) in the frames centre.

The installation detail includes the use of PIR rigid insulation to the internal returns that butts up to the window frames to reduce cold bridging.

Windows:-	<p>Triple low-e glazing filled with argon gas. Warm edge spacer bar</p> <p>Secure by Design</p> <p>U-value Glazing = 0.65/(m2K)</p> <p>g-value Glazing = 0.63</p> <p>U-value Frame = 0.78/(m2K)</p>
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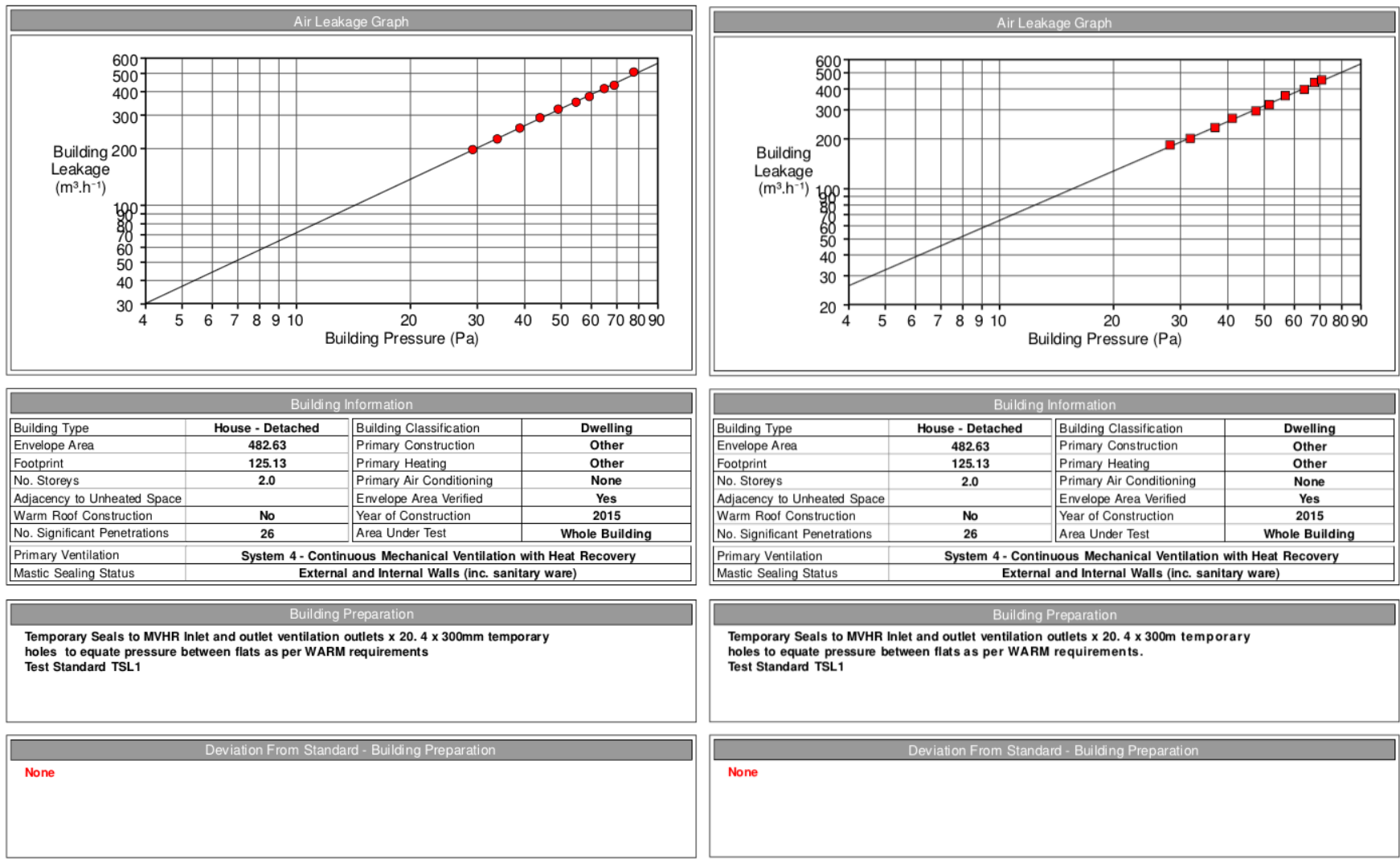
6 Description of the airtight envelope; documentation of the pressure test result

A continuous airtight membrane (Vapour control layer) was used around the inside of the timber stud walls and taped at all edges and junctions. At the roof/ceiling level the airtight membrane was fixed to the underside of the trusses. A layer of plasterboard was fixed beneath this to support the insulation with care taken to ensure that fixing points did not puncture the airtight membrane in locations not backed by the trusses.

A further service void and the plasterboard finishes were provided to the inside of the airtightness line.

The airtight membrane was taped to the building DPM below the screed.

The air pressure test was carried out by MS air testing, the air leakage at depressurisation was 0.59 h-1 @50 Pa, and 0.60 h-1 @50 Pa at pressurisation.



Building Conditions

Item	Results
All external doors closed	Yes
All external windows closed	Yes
All internal doors open	Yes
No. of air handling plant shut down and sealed	Yes 4
All smoke louvers closed	N/A
All drainage traps filled with water	Yes
All boilers shut down if inside building envelope – do not seal flues	N/A
Lifts doors closed but not sealed	N/A
Trickle ventilators closed and/or sealed	N/A
All floor penetrations sealed with tape	
Type of building	4 Flats domestic living
Estimated year of construction	2015
Primary Heating	None
Primary Ventilation	Mechanical Ventilation Heat recovery
Primary Air Conditioning	None

Building Volumes as supplied by Quattro Designs as:-

542m³

Result summary for De-pressurisation

$n_{50} = Q_{50} / V$

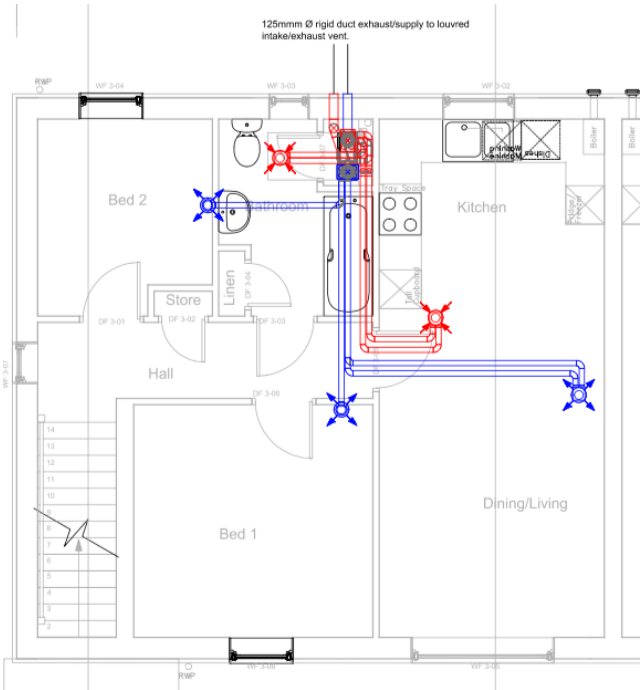
Q ₅₀ : Airflow (m³. h ⁻¹)	Building Volume m³	ACH (air changes/hour m³)
326	542	0.601

Average Air Changes Per Hour (ACH) between Pressurisation and De-Pressurisation

De-pressurisation (ACH)	0.584
Pressurisation (ACH)	0.601
Average	0.592

7 Planning of ventilation ductwork

A passive house certified MVHR unit (Zehnder - ComfoAir 160) was provided for each individual apartment. The unit was located adjacent to external wall in a Bathroom. The doors within the apartment were not fire rated and were provided with 10mm undercuts to enable air to circulate within the apartment. Fresh air was supplied to each of the 3No. habitable rooms (bedrooms and living space) and extracted from the kitchen and bathroom.



Ductwork plan

Legend:

- Blue = supply of fresh air to 3no. Habitable rooms (ducts to bedrooms were extended further into room)
- Red = Extract points from kitchen and bathroom.
- Intake and exhaust located on wall adjacent to unit as indicated. (Louvres designed to limit cross flow as they are located less than 3 meters apart)

7.1 Ventilation Unit

The MVHR unit was a Zehnder - ComfoAir 160. Installed within a well ventilated cupboard within the bathrooms. The installed heat recovery was 86.5 % Specific power input 0.36 Wh/m³



8 Heat supply

Individual gas combination boilers to each apartment were provided with radiators in each room for space heating. Domestic Hot water provided by 15mm diameter pipework with the apartment layout designed to limit distances between the boiler and the hot water taps.



9 PHPP calculations

The verification sheet from PHPP

Passive House verification



Building:	67 A to D				
Street:	Witch Hazel Road				
Postcode / City:	BS13 0QG Bristol				
Country:	UK				
Building type:	Flats				
Climate:	[UK] - Severn (Lyneham)			Altitude of building site (in [m] above sea level):	78
Home owner / Client:	Solon South West Housing Association				
Street:	1 Newfoundland Court, St Paul Street				
Postcode/City:	BS2 8AN Bristol				
Architecture:	Quattro Design Architects				
Street:	Matthews Warehouse, High Orchard St				
Postcode / City:	GL2 5QY Gloucester				
Mechanical system:	Greenwood Airvac				
Street:	Unit 4, Watchmoor Point				
Postcode / City:	GU15 3AD Camberley, Surrey				
Year of construction:	2016	Interior temperature winter:	20.0	°C	Enclosed volume V_{e, m^3} : 704.8
No. of dwelling units:	4	Interior temperature summer:	25.0	°C	Mechanical cooling:
No. of occupants:	6.2	Internal heat sources winter:	3.0	W/m²	
Spec. capacity:	60	Ditto summer:	2.3	W/m²	

Specific building demands with reference to the treated floor area

		Treated floor area	216.9	m²	Requirements	Fulfilled?*
Space heating	Heating demand		13.01	kWh/(m²a)	15 kWh/(m²a)	yes
	Heating load		11	W/m²	10 W/m²	-
	Frequency of overheating (> 25 °C)		0.0	%	-	-
Primary energy	Heating, cooling, dehumidification, DHW, auxiliary electricity, lighting, electrical appliances		100	kWh/(m²a)	120 kWh/(m²a)	yes
	DHW, space heating and auxiliary electricity		54	kWh/(m²a)	-	-
Airtightness	Pressurization test result n_{50}		0.6	1/h	0.6 1/h	yes

* empty field: data missing; '-': no requirement

Passive House?

yes