

**Passivhaus Designer Re-certification – Peter Ranken
(Renewal of Passivhaus Designer Certificate issued March 2019, expiring March 2024)**

Foleshill Health Centre, Coventry

Revision A 9 June 2024



View of the entrance to Foleshill Health Centre

Foleshill Health Centre is the first Passivhaus built for the UK National Health Service. The staff within the building provide primary health care services to the residents of Foleshill, an inner city area to the north of the centre of Coventry.

The building was designed by Tooley Foster, with project architect Peter Ranken, who was also the Passivhaus Designer. This is his first non-residential Passivhaus project.

Foleshill Health Centre provides the following accommodation:

- Five consulting rooms for doctors
- Two treatment rooms for minor treatments, dressing changes, etc
- Reception and waiting room
- Utility rooms for the storage and disposal of medical equipment
- Staff meeting rooms and offices
- Patient and staff wcs and service spaces

Treated Floor Area	Annual Heating Demand	Heating Load	Cooling Load	Primary Energy Renewable Demand	Heat Recovery Efficiency	U-values			
						Wall	Roof	Ground Floor	Window
	kWh/m ² .a	W/m ²	W/m ²	kWh/m ² .a		W/m ² K	W/m ² K	W/m ² K	W/m ² K
477.6 m ²	17.3	10.4	1	71	86%	0.143 render 0.135 Rain-screen	0.100	0.107	0.996 to 1.063

Air leakage was tested at 0.525 air changes per hour at 50Pa. See certificate later.

The building is listed on the Passivhaus Database held by the International Passive House Association. The listing can be viewed at:

[Passive House Buildings \(passivehouse-database.org\)](https://passivehouse-database.org)

The PH database reference is ID 7593

2. Abstract of Building Project

Foleshill Health Centre is the first Passivhaus certified NHS health care building in the UK.

It was built for Community Health Partnerships following two proof of concept projects, based on existing health centres, which proved energy and whole life cost savings if they had been built to the Passivhaus classic standard.

The building fully complies with NHS technical standards for infection control, layout and operation.

It was a client requirement that it should be constructed using off site volumetric modules (to reduce construction time on site), to achieve BREEAM Excellent and to be certified to the Passivhaus Classic standard.

It was built during the Covid pandemic using overclad Portakabin volumetric building modules. The walls are overclad with insulated render, a second insulated roof was added and an insulated raft foundation was used.

Point of use hot water units avoid the energy losses of recirculating hot water.

Heating is by air source heat pump and radiators.

Ventilation is by two Swegon units and the two treatment rooms have one Zehnder MVHR unit per room to provide high air change rates to reduce infection risks.

The building has been monitored in detail for three years and energy use has been exactly as predicted by PHPP.

Architect and Passivhaus Designer Peter Ranken designed the building and obtained planning approval. He is also currently Director of Sustainability at Tooley Foster. Construction information was prepared by Portakabin and their sub-contractors informed by construction detailing and Passivhaus advice from the Peter Ranken, including thermal bridge modelling.

The Passivhaus Certifier was WARM Low Energy Building Practice.

3. Elevation Views of the Building



*Front (south facing) elevation to Livingstone Road
– pergola provides shading to SW and S facing windows to waiting room*



*East facing elevation toward garden
Ground floor consulting rooms face private garden area
Note MVHR inlet and discharge terminals on clean side of the building (not to car park)*



Rear elevation facing north. Note heat pump and air conditioning units and discreet rear access for staff.



West facing elevation towards car park. Entrance and waiting room at south west corner of the building.

4. Exemplary Photos from Inside the Buildings



Reception desk and waiting room



Treatment room (without couch)



Doctor's consulting room

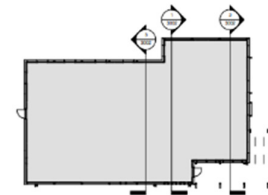
5. Sectional View of The Buildings

This health centre is built using volumetric modules built off site by Portakabin. A video showing the construction process can be found here:

<https://youtu.be/YzzBRp6XJRU>

Each module is a storey high and has its own floor and ceiling/roof. This enabled the building to be erected and made watertight in three days. The height of the building is greater than a conventional building due to the following:

- duplicated structure of the ground floor ceiling and floor to the storey above
- duplicated roof and floor structure – the standard modules are insulated to comply with Building Regulations, but additional insulation was required for Passivhaus



6. Floor Plans

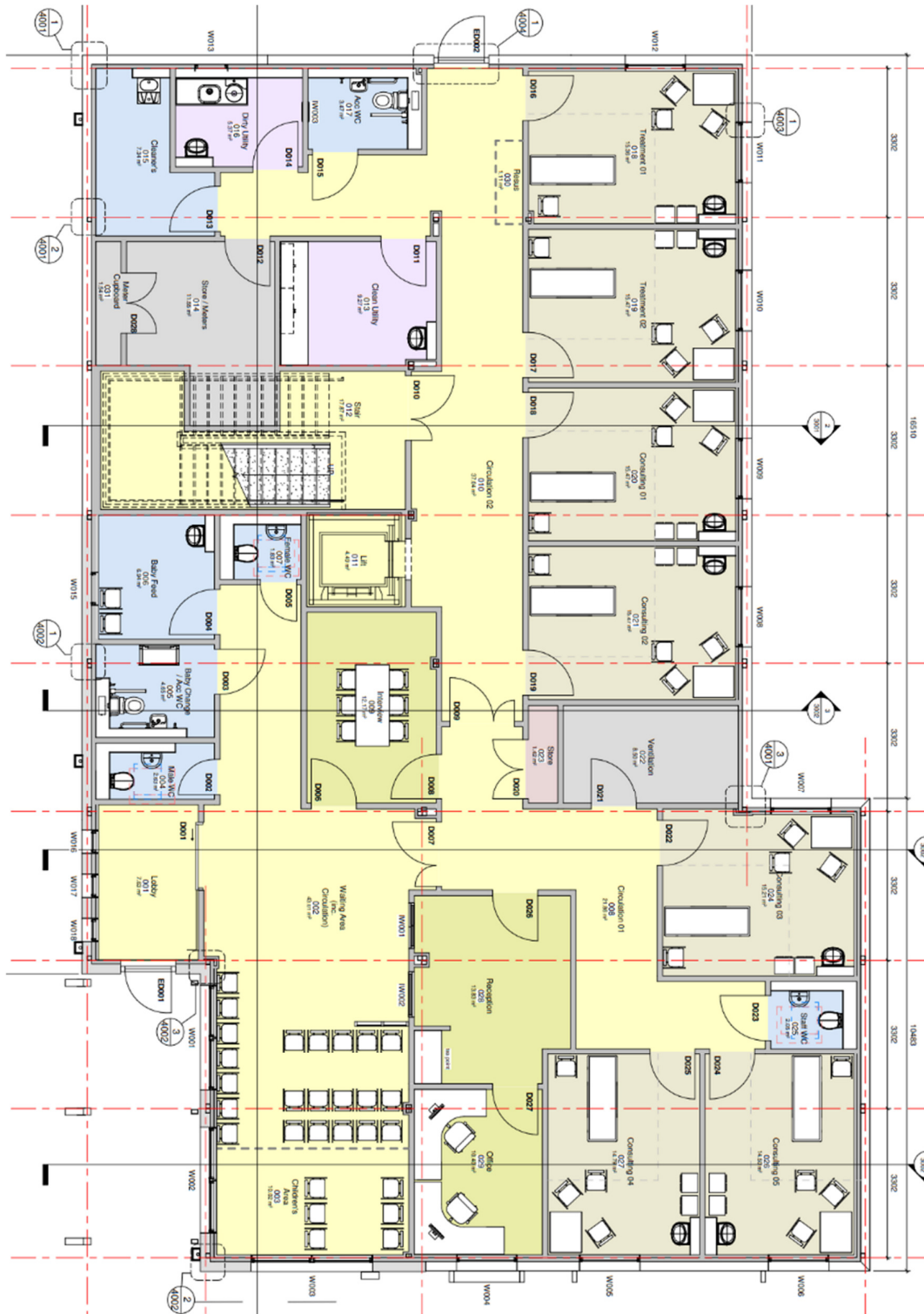
My design for Foleshill Health Centre locates spaces for patient access on the ground floor, with staff only areas on the first floor. Whilst putting some patient areas on the first floor would have made a more compact building with a better form factor it would have hindered the flow of patients through the building and made it more difficult to separate out staff and record spaces from those used by patients. The grid layout is based on standard Portakabin modules, each of which were fully fabricated at the Portakabin factory in York. The modules were fully finished including some electrics and plumbing, but there was more finishing work on site than usual for Portakabin due to social distancing rules during Covid which restricted the number of people who could work in a module at one time.

Consulting rooms face a small garden area to the east with the waiting area and entrance near the car park.

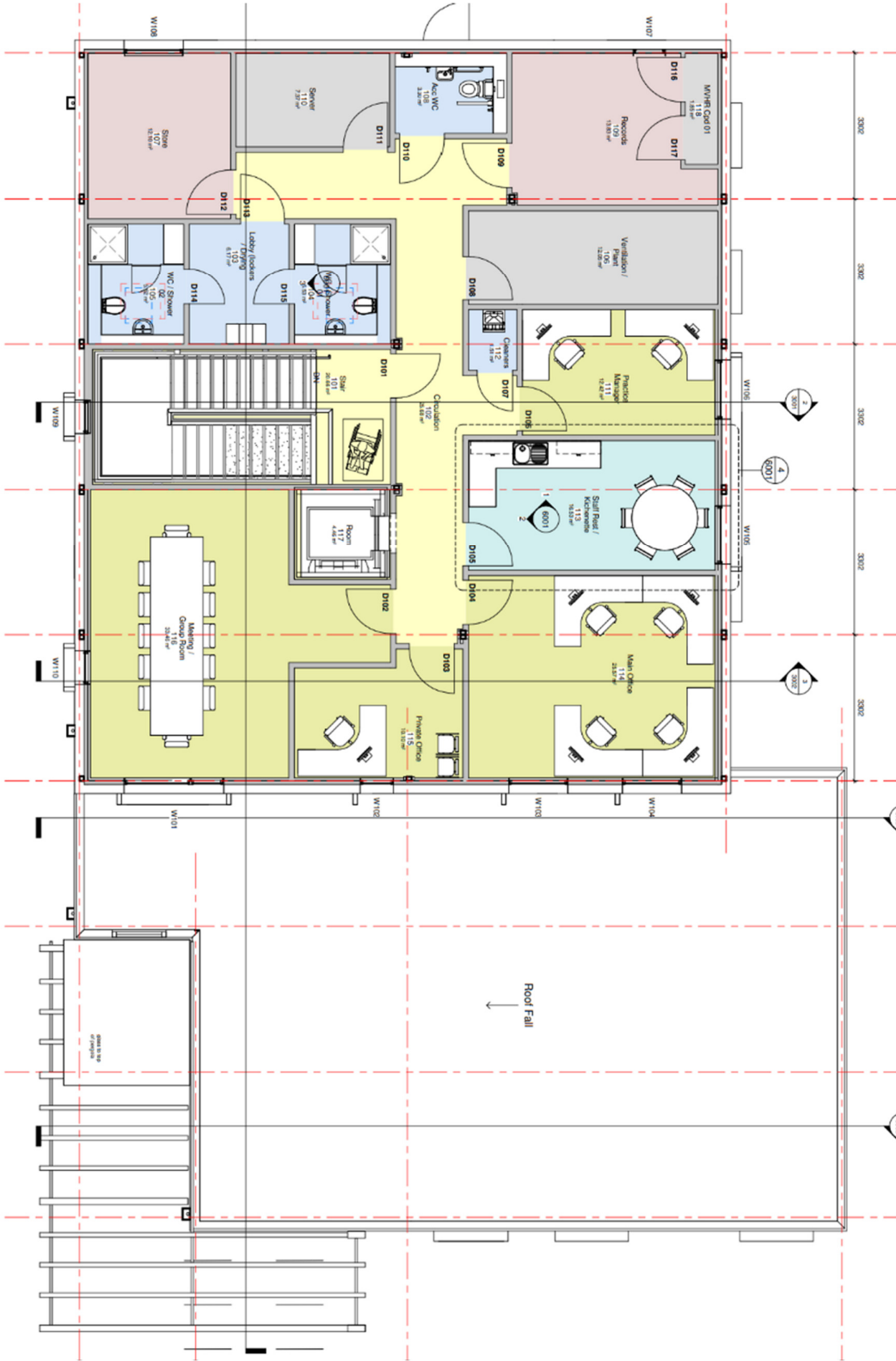
Site Plan



Plans



Ground floor plan – consulting rooms in beige, facing garden space; reception in green, wcs in blue, medical utility spaces in pink



First floor plan – offices and staff areas

7. Construction of Floor Slab

An Isoquick insulated reinforced concrete raft was used to support the Portakabin modules, with a 400mm thick slab to address uneven ground conditions (the site was a former public swimming pool). The construction sequence is shown in the detail below:

Phase 1 – insulated raft

Phase 2 – standard Portakabin modules

Phase 3 – I recommended a variable height section of insulation to allow for levelling shims below the Portakabin modules

Phase 4 – site installed overlaid insulation, render and rainscreen

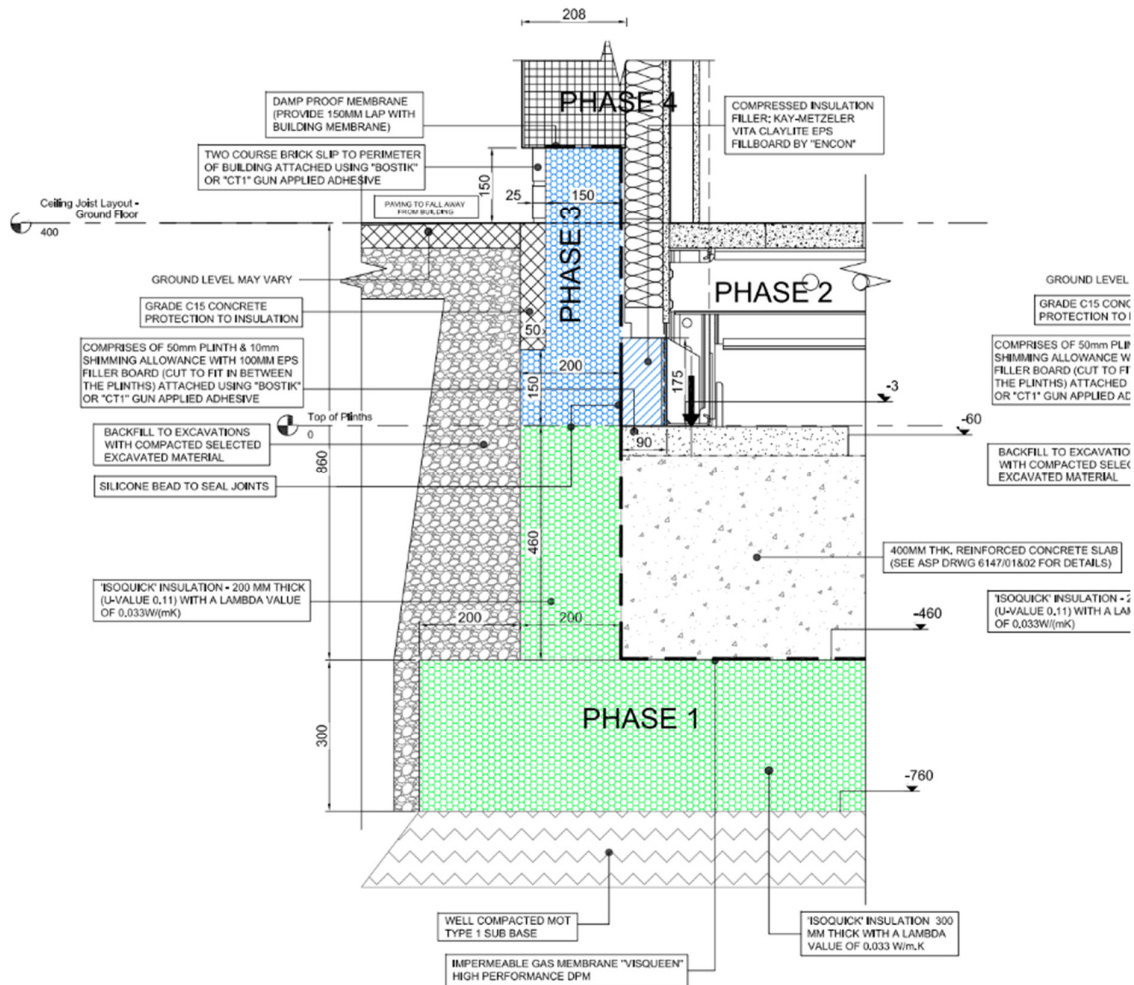




Photo of under floor slab installation. .

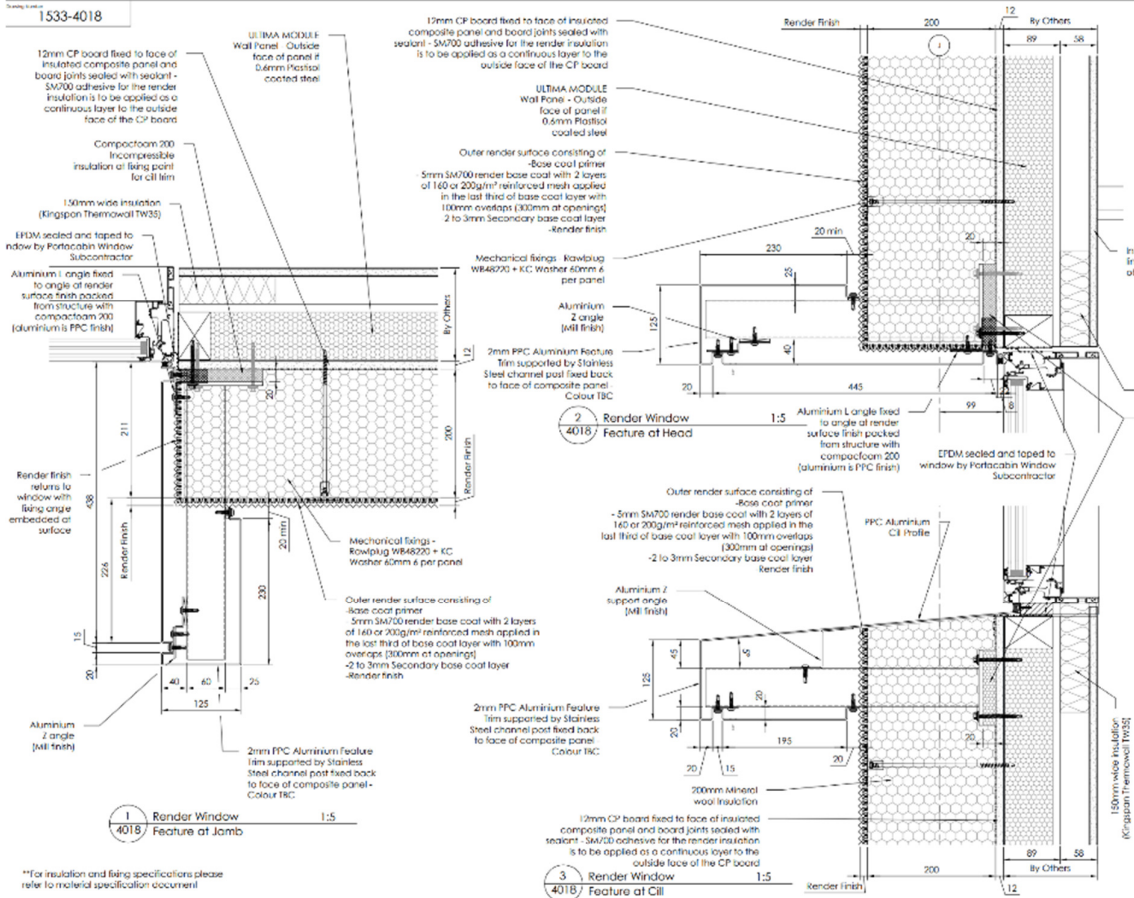
8. Construction of the Exterior Walls

Standard Portakabin walls are constructed as a structural insulated panel, timber framed with plasterboard internally and a plastisol coated steel panel externally.

To reduce the U value of the external walls I recommended an insulated render EWI system – this gave flexibility during the design process and was straightforward to add to the Portakabin modules.

On site works included:

- additional internal service void for cables etc to maintain the integrity of the standard insulation and to allow additional insulation at window reveals to mitigate thermal bridging
- additional external sheathing board to allow fixings for 200mm insulation and render
- 225mm insulation and rainscreen cladding adjacent to the entrance.
- Joints between modules sealed with airtight tape and all modules wrapped in Tyvek structure wrap airtightness membrane.

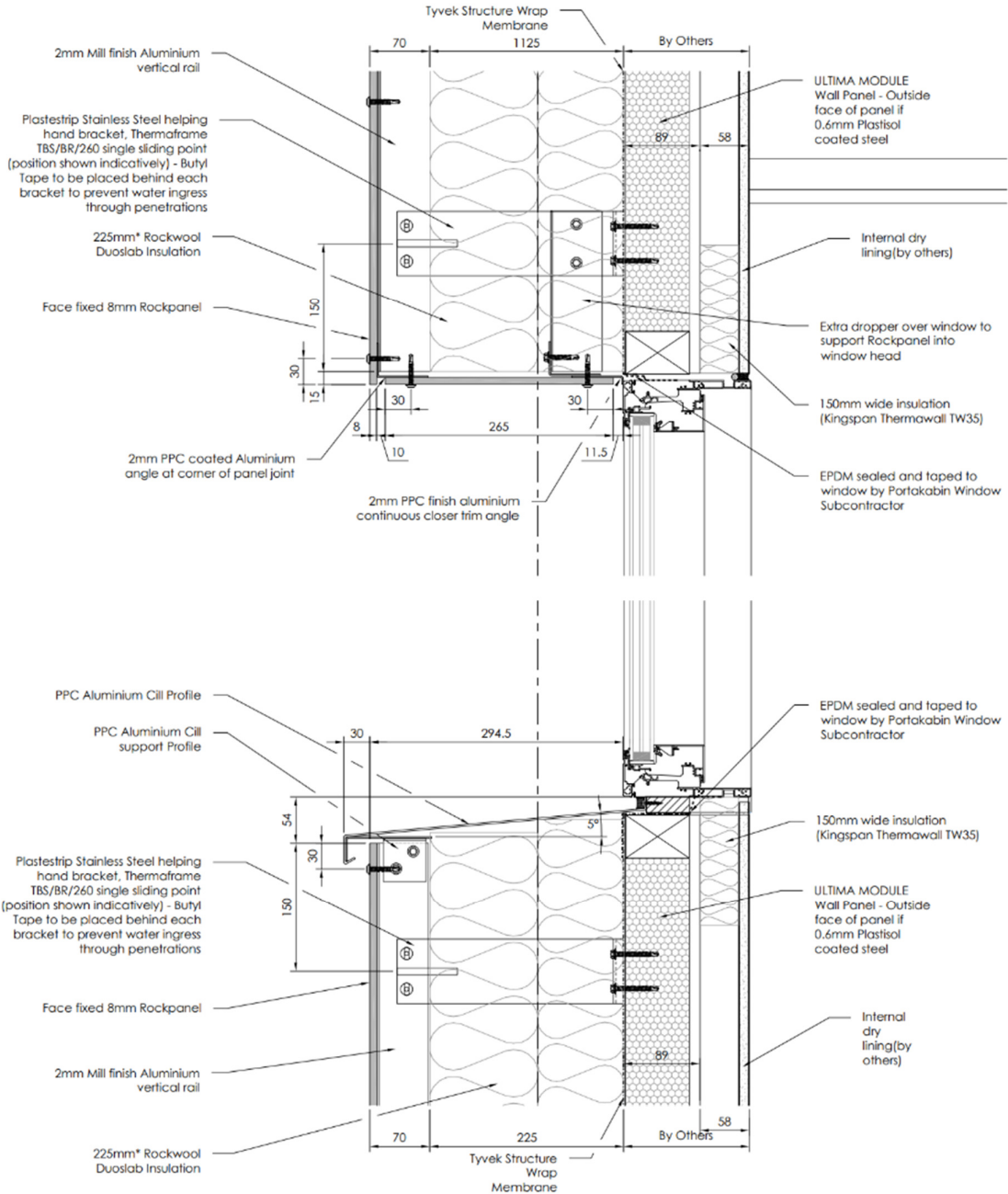


*For insulation and fixing specifications please refer to material specification document

Typical detail showing standard Ultima wall panel, external insulated render and internal service void. Also shown are brise soleil components with thermally broken fixings.



Rear elevation external wall during construction – note airtight layer and air sealing at heat pump pipework



Typical detail showing standard Portakabin Ultima wall panel with insulated rainscreen and internal service void.

Note that in both details windows are shown located within the standard module wall zone for factory installation and to allow a weathertight building envelope after module installation on site.

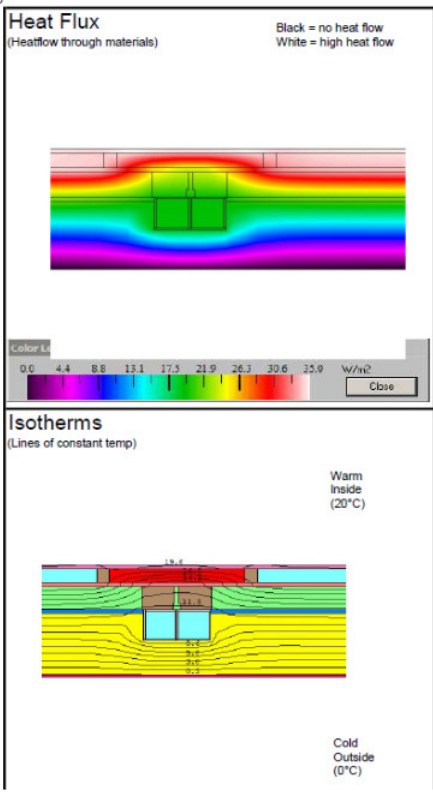
The Portakabin Ultima modular volumetric construction system has external columns which align with the timber studs in the wall panels and reduce the thickness of the additional insulation. Thermal bridge analysis using Therm was required to determine the additional heat loss of this construction.

Calculation sheet provided by
WARM: Low Energy Building Practice
 3 Admirals Hard, Plymouth PL1 3RJ - 01752 542 548 - www.peterwarm.co.uk

Calculation carried out by
 Warwick House, 118 Palmerston Road,
 Buckhurst Hill, Essex IG9 5LQ
 Tel: 020 8504 9711
 email: info@accreditedpassivhausdesign.com



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Ambient Junction

Software: Therm 7.4.3 Date: 17/08/2020
 Job Name: Foleshill GP Surgery Job No: S190
 Tab name: Ambient Junction Completed by: JJC
 Descr: Typical Wall Double SHS Post Checked by: PAR/Wam

Data column	Row	Name	Ufactor nam	Length mm	U factor	L2D W/Km
S	16	Wall 1	Internal	2000	0.1082	
T	16	Wall 2	Internal	2000	0.1082	
U	16	L2D	External			0.2350

U - value calculation for data row Wall 1
 Check surface resistances correct y
 Check total length correct y
Modelling U Value (W/m2K) 0.108

U - value calculation for data row Wall 2
 Check surface resistance correct y
 Check total length correct y
Modelling U Value (W/m2K) 0.108

Psi calculation

	length mm	U-value/L2D W/m2K	heat flow W/mK	psi value W/mK
L2D				0.235
FALSE	Length time U value: 1000	0.108		0.108
Wall 2	Length time U value: 1000	0.108		0.108
				0.019

psi Internal 0.02 W/mK

Psi calculation

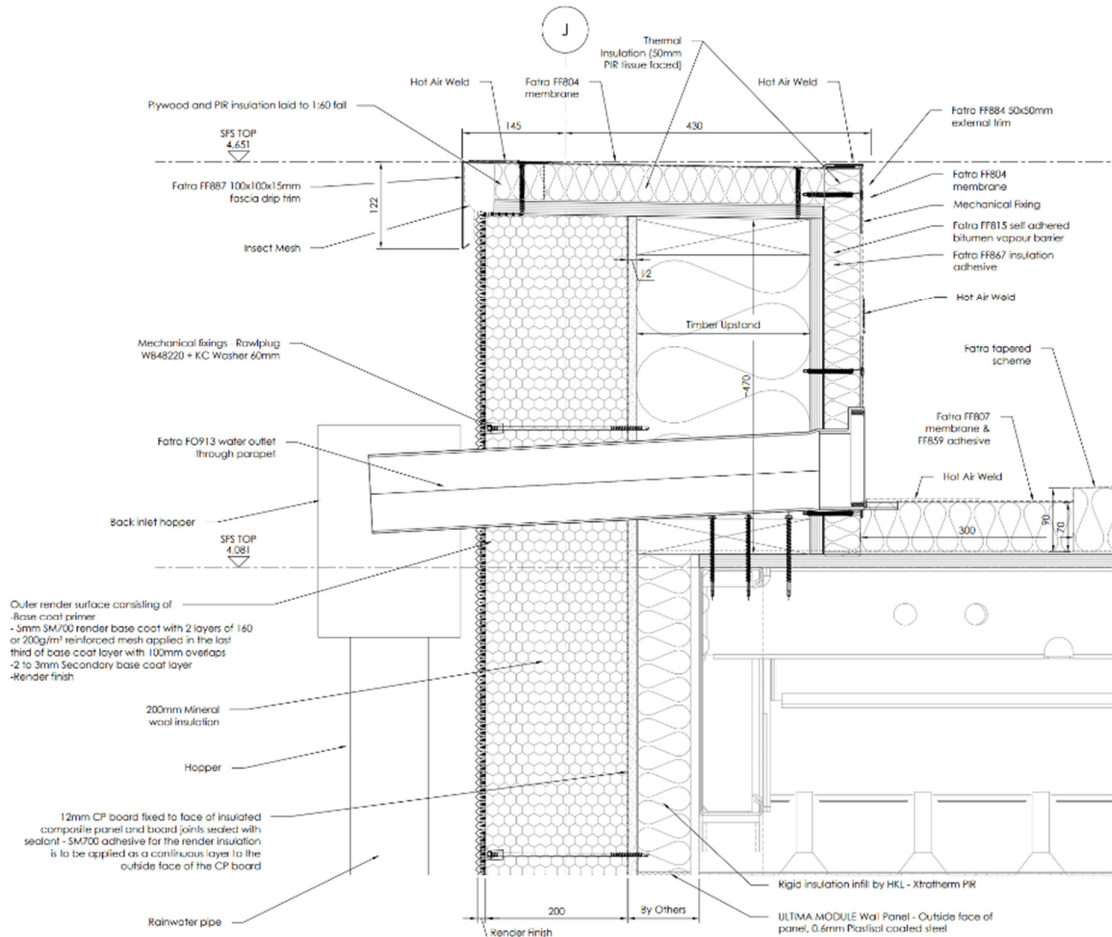
	length mm	U-value/L2D W/m2K	heat flow W/mK	psi value W/mK
L2D				0.235
Wall 1	Length time U value: 1000	0.108		0.108
Wall 2	Length time U value: 1000	0.108		0.108
				0.019

psi External 0.02 W/mK

Error in calculation: From them report - worst cell **6.5 %**

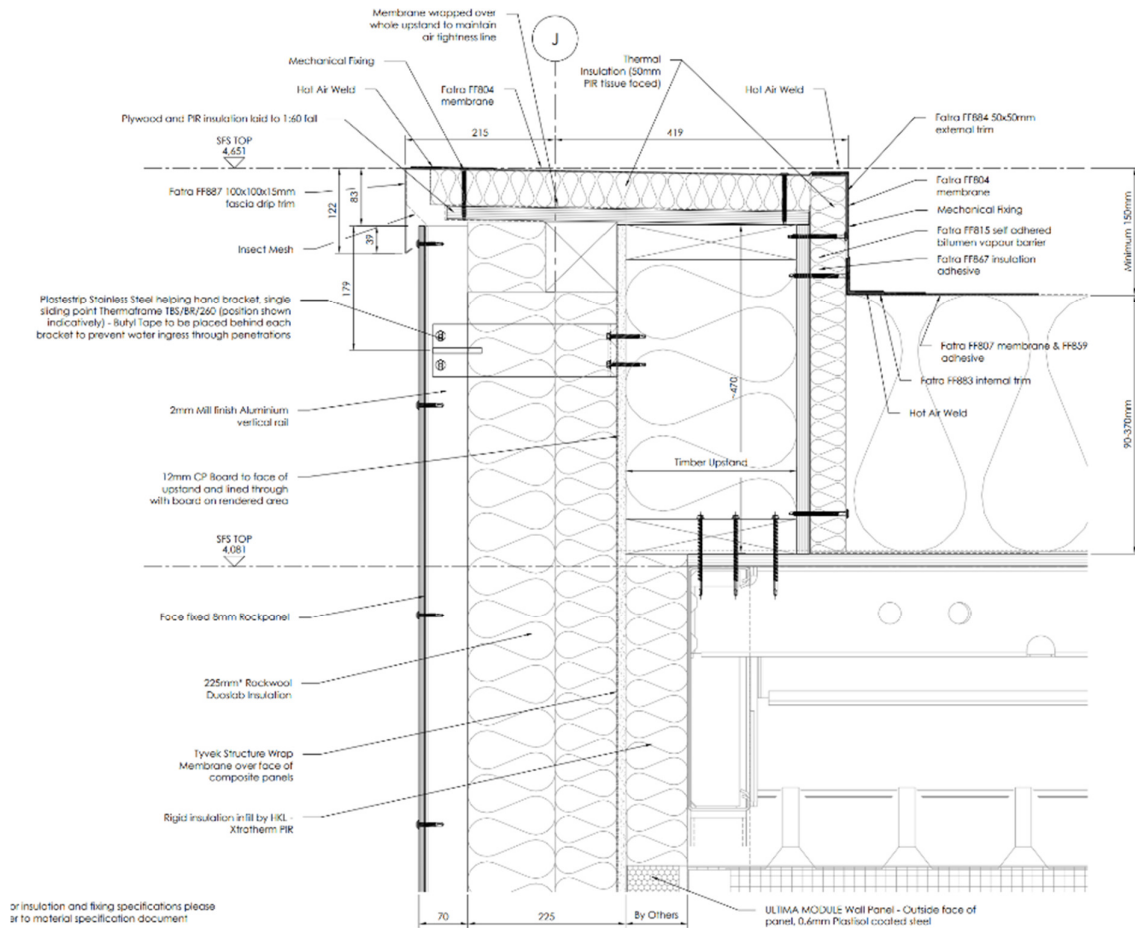
Thermal bridge analysis of additional heat loss at external column positions.

9. Construction of the roof/ ceiling of the top floor



Detail showing roof parapet at rainwater outlet. Thermal bridging through the timber structure of the parapet is minimised by an outer layer of insulation.

The Portakabin modules are designed to be weatherproof immediately after installation on site, with insulated panels that are sufficient for Building Regulations compliance. As the modules are made on a production line, varying the construction for Foleshill to reduce U values would have required lost production time retooling for Foleshill and retooling back for following non-Passivhaus projects. I therefore advised that walls and roof would be overlaid with extra insulation and waterproofing.



Detail showing roof parapet at top of roof slope, with plywood roof deck, additional insulation and single ply roof.

10. Windows and the Installation of the Window

The windows and external doors are Ideal Combi Futura+i, and are all triple glazed, with tilt and turn operation. The windows were installed at the Portakabin factory in York within the depth of the standard Portakabin module, taped to the metal outer panel of module walls. Cills were installed on site. Futura+i frames are narrow enough to fit within the wall depth without hindering the production process in the factory, and to allow transportation without damage. Cills were fixed on site.

The thermal properties of the frames and glazing are as follows:

- U value of frame U_f 0.96 W/m²K
- Glazing spacer Psi value 0.033 W/mK
- U value of glass U_g – these vary dependent on the type of glass used – an extract of the data included in PHPP is below
- G value of glazing – these also vary, and are also shown below
- Average window U values are as follows:

Building assembly overview	Average U-value [W/(m²K)]
North windows	1.071
East windows	0.971
South windows	0.935
West windows	0.990
Horizontal windows	
Exterior door	
External wall - Ambient	0.138
External wall - Ground	0.141
Roof/Ceiling - Ambient	0.084
Floor slab / Basement ceiling	0.101

	g value	Ug-Value
IdealCombi 3063m014405 security	0.52	0.60
IdealCombi 3063mh146844 safety	0.52	0.60
Ideal Combi Type D standard	0.53	0.57
Ideal Combi TGU low-E (48mm) Medi g	0.53	0.52
Ideal Combi Safety 3043mh146848	0.52	0.54
Ideal Combi Security 3043m016848	0.53	0.54
Ideal Combi obscure 3043m01684804	0.52	0.54
IdealCombi Safety PTK 3043m01646848	0.51	0.57

Extract of PHPP showing glazing Ug and g values

11. Airtight Building Envelope


Measures to reduce air leakage include:

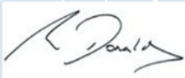
- Walls – metal clad sandwich panel walls with intelligent airtight and vapour control layer installed to external face, taped joints between sandwich panels
- Ground floor – in-situ concrete slab with taped connection to external wall airtightness layer
- Roof – Intello membrane with taped joints fixed to underside of trussed rafters, edges taped to wall plaster
- Junctions – taped with airtight tape as shown on details, tape being ProClima Tescon No. 2 or Contega Solido SL or equivalent.

The air test results for the building are as follows:

Airtightness Test Certificate

This is to certify that the following test and results have been produced in compliance with England and Wales regulation 43 of the Building Regulations 2010, Scotland Section 6 of the Domestic and Non-Domestic Handbook, Northern Ireland Technical Booklet and Isle of Man The Building Control (Approved Documents) Order 2014. A full report in line with the current approved procedures can be requested from the IATS tester.
This certificate also demonstrates the results achieved when conducting Airtightness Testing to Passivhaus standards.



Unique Certificate Number	10193012
Date of Test	21 st May 2021
Building name / Plot number	Foleshill GP Surgery
Building Address	Livingston Road, Coventry.
Envelope Area of Building m ²	1360
Volume of Building m ³	1518.00
Report Reference	21-05-21
Tester's Name	Nick Donald
Company Name	L & F Solutions Ltd
IATS Tester No.	0056
Tester's level of competence	Level 2: Buildings > 4000m ²
Related party disclosure	No related party
Signed	

Results for Building Compliance

r ² (Correlation >=0.98 - <=1.00)	0.9939
n (Slope >=0.50 - <=1.00)	0.733

Measured Air Permeability = 0.58m³/(h.m²) @ 50Pa

Results for Passivhaus and Low Energy Building

	Pressurised test	Depressurised test
r ² (Correlation >=0.98 - <=1.00)	0.9968	0.9909
n (Slope >=0.50 - <=1.00)	0.619	0.848
n ₅₀ (Air Changes per Hour)	0.62	0.43

Average Air Changes per Hour (n₅₀) = 0.525h⁻¹ @ 50Pa

Independent Airtightness Testing Scheme
16 St Johns Business Park,
Lutterworth,
Leicestershire, LE17 4HB

e: certificate@iats-uk.org
t: 0300 688 0016
w: iats-uk.org
Company Registration No:
09309058

Air test certificate confirming air leakage of 0.525 air changes per hour at 50Pa

12. Ventilation

As Passivhaus Designer I prepared a detailed spreadsheet for the determination of ventilation rates for each space in the building based on HBN 03-01 guidance for health buildings for infection control, or following Passivhaus guidance where specific ventilation rates for mechanical ventilation are not described for some rooms.

NHS Health Technical Memorandum HTM03-01 specifies ventilation rates for rooms within health buildings. These are shown below:

Appendix 2 – Recommended air-change rates

Application	Ventilation	AC/hr	Pressure (Pascals)	Supply filter	Noise (NR)	Temp (°C)	Comments (for further information see Chapter 6)
General ward	S/N	6	–	G4	30	18–28	
Communal ward toilet	E	6	–ve	–	40	–	
Single room	S/E/N	6	0 or –ve	G4	30	18–28	
Single room WC	E	3	–ve	–	40	–	
Clean utility	S	6	+ve	G4	40	18–28	
Dirty utility	E	6	–ve	–	40	–	
Ward isolation room	–	–	–	–	–	–	See Health Building Note 04-01 (Supplement 1)
Infectious diseases isolation room	E	10	–5	G4	30	18–28	Extract filtration may be required
Neutropenic patient ward	S	10	+10	H12	30	18–28	
Critical care areas	S	10	+10	F7	30	18–25	Isolation room may be –ve pressure
Birth room	S & E	15	–ve	G4	40	18–25	Provide clean air-flow path
SCBU	S	6	+ve	F7	30	18–25	Isolation room may be –ve pressure
Preparation room (lay-up)	S	>25	35	F7	40	18–25	
Preparation room/bay (sterile pack store)	S	10	25	F7	40*	18–25	*50 NR if a bay in a UCV theatre
Operating theatre	S	25	25	F7	40	18–25	
UCV operating theatre	S	25*	25	H10 or greater	50	18–25	*Fresh-air rate; excludes recirculation
Anaesthetic room	S & E	15	>10	F7	40	18–25	Provide clean air-flow path
Theatre sluice/dirty utility	E	>20	–5	–	40	–	
Recovery room	S & E	15	0	F7	35	18–25	Provide clean air-flow path
Catheterisation room	S	15	+ve	F7	40	18–22	
Endoscopy room	S	15	+ve	F7	40	18–25	
Endoscopy cleaning	E	>10	–ve	–	40	–	
Day-case theatre	S	15	+ve	F7	40	18–25	
Treatment room	S	10	+ve	F7	35	18–25	
Pharmacy aseptic suite	S	20	#	H14	–	18–22	# See EGGMP (Orange guide) ^a
Category 3 or 4 containment room	#	>20	#	H14*	–	18–22	# See ACDP guide; *Filter in extract
Post-mortem room	S & E	S = 10 E = 12	–ve	G4	35	18–22	Provide clean air-flow path
Specimen store	E	–	–ve	–	–	–	Fan accessible from outside of store

Notes: 18–22°C indicates the range over which the temperature may float.

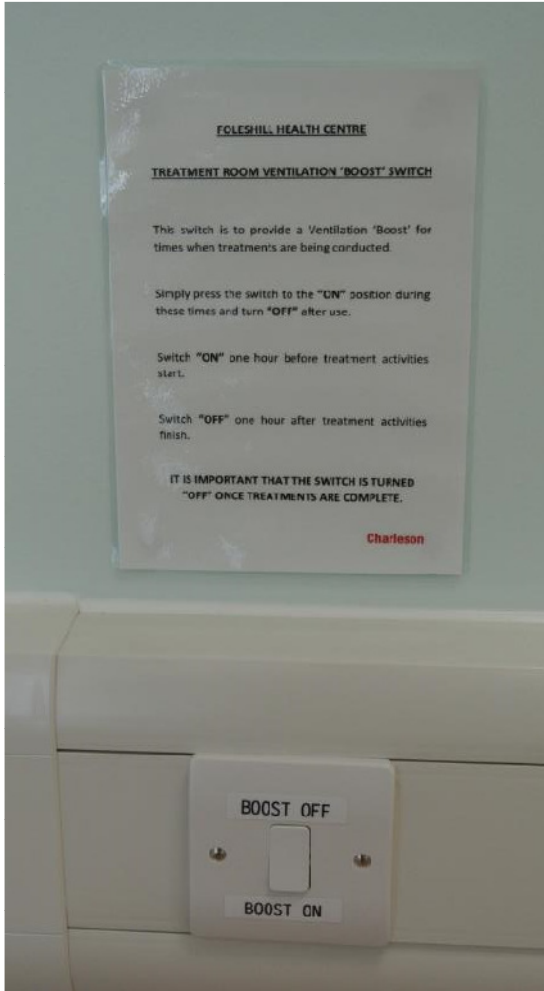
HTM03-01 ventilation rates – note the rate for treatment rooms. Also that F7 supply air filtration is required for standard operating theatres – the same level of filtration required for Passivhaus.

The recommended rate for treatment rooms is 10 air changes per hour for infection control during treatment activities when wounds may be open. This is a ventilation rate much higher than usually provided for Passivhaus buildings. In addition, there is no guidance for the ventilation of consulting rooms (natural ventilation being expected). To

avoid excessive ventilation heat losses the ventilation design, led by myself as the Passivhaus Designer included:

- One MVHR unit per treatment room, with a boost rate that can deliver 10 air changes per hour, only when treatment activities occur plus one hour before and after. This is expected to be for 4 hours a day, 4 days a week. The unit needed to be big enough to deliver the boost rate but also deliver a lower rate suitable for ordinary patient consultation activities. The boost rate is manually selected by medical staff using a switch in each treatment room.
- Outside treatment activities, treatment room ventilation rates reduce to the same level as consulting rooms
- Consulting room ventilation rates were determined at 90m³/h per room. This figure is based on 30m³/h for each occupant (eg. Doctor, patient and chaperone), at maximum occupancy. This is a slightly high figure, and I understand that the PHI for the Frankfurt Passivhaus hospital used 80m³/h for consulting rooms. For future projects I would suggest a ventilation rate of between 75 and 80m³/h because many consultations occur with only two people in the room. Whilst the NHS HBN 03-01 has been updated since the Covid pandemic, no guidance remains for ventilation rates for consulting rooms, other than a recommendation for natural ventilation.
- Waiting room ventilation rates were based on expected occupancy at the time of design prior to the Covid-19 pandemic, based on up to 28 patients waiting at a time. Now that most NHS GP appointments are either online or pre-booked, the number of spaces for waiting patients and associated ventilation rates could be reduced.
- Two Swegon thermal wheel MVHR units were chosen to serve the remainder of the building. Extract air filtration was increased to F7 from G4 on the advice of NHS England to minimise cross infection from exhaust air contaminating incoming air in these thermal wheel units.
- To minimise heat losses outside opening hours all ventilation units set back to trickle, with a one hour flushing period before and after opening hours.

As Passivhaus Designer I prepared a detailed spreadsheet for the determination of ventilation rates for each space in the building based on HBN 03-01 guidance for health buildings for infection control



Treatment room boost switch.

12.1 Layout of the Ventilation System Ducting

Concept duct layouts were prepared by Peter Ranken and included in the general arrangement plans. Detailed installation layouts were prepared by suppliers and installers Charlesons. Copies of the installation drawings are included in the appendices.

12.2. Ventilation Units

The following units were installed

- Zehnder Q600 MVHR system for each treatment rooms(1no. per room) with Comfoclime 36 supply air cooling units
- Swegon MVHR systems for elsewhere. This manufacturer has been used for NHS hospitals on other sites.

13. Heating and Cooling.

Heating is by air source heat pumps serving radiators.

To eliminate the risk of the first NHS Passivhaus building overheating, Community Health Partnerships requested supply air cooling be provided to all MVHR units.

The cooling load for the project was determined

CIBSE TM52 Adaptive Comfort and ISO 7730 Thermal Comfort Assessments were carried out by Portakabin using IES VE, with the following results:

- Full TM52 compliance with 2020, 2030, 2050 climate data (DSY weather files)
- HTM overheating criteria exceeded for 2030 & 2050 in a few highly occupied spaces
- Overheating minimized by window shading and cooling coils on ventilation units to temper supply air
- TM54 energy analysis for BREEAM credits




14. Hot Water

Hot water in health buildings is traditionally provided by boiler with hot water storage and circulation pipes serving each draw off point. Hot water circulation is never switched off, except for six monthly maintenance to minimise infection risk (mainly legionella). This leads to excessive energy consumption and heat losses and unwanted heat gains in summer. I specified that Foleshill Health Centre should have hot water provided by point of use water heaters throughout – this is compliant with HSE guidance for legionella control and significantly reduces energy use, as storage is eliminated and only the amount of water necessary is heated.

15. Short Documentation of PHPP (Verification Sheet)

A copy of the PHPP verification sheet for Foleshill Health Centre, as issued by WARM Low Energy Practice, is below:

Passive House Verification



Architecture: The Tooley & Foster Partnership
 Street: 116 Palmerston Road
 Postcode/City: IG9 5LQ Buckhurst Hill
 Province/Country: Essex GB-United Kingdom/ Britain

Energy consultancy: Accredited Passivhaus Design
 Street: 116 Palmerston Road
 Postcode/City: IG9 5LQ Buckhurst Hill
 Province/Country: Essex GB-United Kingdom/ Britain

Year of construction: 2020
 No. of dwelling units: 1
 No. of occupants: 58.0

Building: Foleshill Health Centre
 Street: Livingstone Road
 Postcode/City: CV6 6AR Coventry
 Province/Country: West Midlands GB-United Kingdom/ Britain
 Building type: Primary Healthcare Building
 Climate data set: GB007a-Sutton Bonnington
 Climate zone: 3: Cool-temperate Altitude of location: 104 m

Home owner / Client: Community Health Partnerships
 Street: Chellenham House, 14-16 Temple Str
 Postcode/City: B2 5BG Birmingham
 Province/Country: GB-United Kingdom/ Britain

Mechanical engineer: Portakabin/CBS
 Street: New Lane, Huntingdon
 Postcode/City: YO32 5PT York
 Province/Country: GB-United Kingdom/ Britain

Certification: WARM: Low Energy Building Practice
 Street: 3 Admirals Hard
 Postcode/City: PL1 3RJ Plymouth
 Province/Country: Devon GB-United Kingdom/ Britain

Interior temperature winter [°C]:	19.3	Interior temp. summer [°C]:	25.0
Internal heat gains (IHG) heating case [W/m²]:	3.5	IHG cooling case [W/m²]:	3.5
Specific capacity [Wh/K per m² TFA]:	60	Mechanical cooling:	x

Specific building characteristics with reference to the treated floor area


		Treated floor area m²		Criteria	Alternative criteria	Fulfilled?²
Space heating	Heating demand kWh/(m²a)	477.6	≤	15	-	yes
	Heating load W/m²	10.40	≤	-	10	
	Space cooling	Cooling & dehum. demand kWh/(m²a)	1	≤	15	
	Cooling load W/m²	1	≤	-	11	
	Frequency of overheating (> 25 °C) %	-	≤	-	-	-
	Frequency of excessively high humidity (> 12 g/kg) %	0	≤	10	-	yes
Airtightness	Pressurization test result n ₅₀ 1/h	0.5	≤	0.6	-	yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	167	≤	-	-	-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	71	≤	60	71	yes
	Generation of renewable energy (in relation to pro-jected building footprint area)	13	≥	-	13	

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: 2-Certifier First name: Mike Surname: Roz
 Certificate ID: 32145-32149_WARM_PH_20211018_MR Issued on: 18/10/21 City: Plymouth

Signature: 

16. Building Costs

The site had previously been a municipal swimming pool and had been purchased by the charity MIND who constructed a building to the west of the health centre. Community Health Partnerships purchased the site from MIND to provide a new health centre to replace a temporary one that had been operating from a pub car park. The design team are not aware of the cost of the site.

A detailed business plan had to be prepared for the project. To comply with NHS procurement protocols this business plan had to be approved by the District Valuer and NHS England. NHS England has also to approve some technical aspects of the design because Passivhaus was not specifically identified within NHS technical guidance.

17. Construction Costs

The project was procured on a partnering basis with Portakabin who are an approved supplier of modular buildings for the NHS. The construction cost was negotiated with Portakabin by cost consultants AECOM.

18. Year of Construction

Construction started in November 2020 and completed in June 2021, during the Covid 19 pandemic. The main contractor, and supplier of the volumetric modules, was Portakabin, and Foleshill Health Centre was their first Passivhaus project.

19. Design and Architect.

Tooley Foster 1892 Ltd designed the building on behalf of Community Health Partnerships and achieved planning consent from Coventry City Council. Architect Peter Ranken of Tooley Foster was retained as Passivhaus advisor during the detailed design and construction stages. He also commented and advised on the construction details prepared by Portakabin and their subcontractors. This included sketch amendments to details prepared by Portakabin in order to minimise thermal bridging.

Tooley Foster worked with the dimensions of standard Portakabin Ultima modules, and incorporated components they had previously specified for Passivhaus projects. These included:

- Ideal Combi aluminium clad composite windows with triple glazing, dimensionally suitable to fit within the depth of the standard Portabin wall panel
- Isoquick insulation for raft foundations
- Zehnder MVHR systems for the treatment rooms
- Swegon MVHR systems for elsewhere. This manufacturer has been used for NHS hospitals on other sites.

20. Information about the building services design

Detailed building services design was carried out by:

- Charlesons for both mechanical and electrical services. Some of their installation work was carried out at the Portakabin factory in York, and completed on site in Foleshill.

The building services strategy was determined by Peter Ranken in accordance with Passivhaus principles to include the following:

- Efficient ventilation with heat recovery, with high performance units, located and installed to maintain efficient operation with minimal lengths of ducts containing air at external temperatures.
- Separate heating system using air source heat pumps serving radiators, enabling rapid user control.
- Point of use hot water
- Sufficient photovoltaic panels on the roof for Passivhaus Classic and Building Regulations compliance.

The building services concept was intended to provide simple systems to install, operate and maintain and was agreed with NHS England in advance of construction.

Concept pipe routes and lengths were determined by the architect Peter Ranken and entered into PHPP.

21. Information about the Planner Of The Building Physics

PHPP energy and comfort analysis of the building was carried out by architect and Passivhaus designer Peter Ranken. This also included thermal bridge analysis using Therm software, and 3D modelling using the Design PH plug in for SketchUp.

22. Information about the Structural Designer

The structural engineer was Portakabin.

23. User's Experiences

Community Health Partnerships have installed a detailed monitoring system to record the following information for the first three years of occupation, ending in June 2024:

- External temperature and internal temperatures in most rooms
- External and internal humidities
- Electricity consumption
- Occupancy
- CO2 and VOC levels in internal air

Energy consumption has been very close to that predicted by PHPP, and the client is convinced that all new Health Centres should be built to the Passivhaus Classic standard.

Community Health Partnerships have commissioned Tooley Foster, AECOM and WARM for a Proof of Concept project for a low energy low carbon retrofit of an existing health centre in Coventry using PHPP, targeting energy consumption as close as possible to the EnerPHit standard.

24. Appendices

Appendices

1. iPHA database ID7593 [Passive House Buildings \(passivehouse-database.org\)](https://passivehouse-database.org)
2. Floor and roof plans
3. Typical construction details
4. Window manufacturers information
5. MVHR installers drawings
6. MVHR unit technical information
7. Final PHPP files
8. Thermal bridge reports
9. Confirmation of Peter Ranken's RIBA membership
[Search the Register \(architects-register.org.uk\)](https://architects-register.org.uk)
10. Building Passivhaus Certification
11. AECOM whole life cost report.