Project Documentation

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RAYNE PARK – BLOCK 22 PLOTS 16, 18 & 20

Data of building

Year of Construction	2021	**Space heating**	**23.61 kWh/(m²a)**
U-value External Wall	0.145 W/(m²K)		
U-value Floor	0.106/0.083 W/(m²K)	Primary Energy Renewable (PER)	93.09 kWh/(m²a)
U-value Roof	0,102/0.176 W/(m²K)	Generation of renewable Energy	0 kWh/(m²a)
U-value Window	0.80 W/(m²K)	Non-renewable Primary Energy (PE)	115.87 kWh/(m²a)
Heat Recovery	91 %	Pressurization test n_{50}	0.89 h^{-1}
Special Features	n.a.		

Brief Description

Passive House Rayne Park

This Terrace is one of the approximately 20 Terrace Blocks which make up the 112 Certified Passivhaus units on the 172 unit scheme for the Local Authority client, Norwich Regeneration Limited.

This is a mixed tenure development (Open Market Sale, Shared Ownership, Affordable Rent and Open Market Rent) consisting of 2,3,4 & 5 Bedroom Houses, and 1,2 and 3 Bedroom Flats. Each Dwelling Type has achieved certification with the non-passive units being built to the current UK Part L 2013 Regulations

This is a Timber Frame SIP Panel Construction project, with heating and how water provided by individual Gas Boilers.

Responsible project participants

Architect	Hamson Barron Smith www.hamsonbarronsmith.com
Implementation planning (MEP)	ALH Building Services Design Limited
Building systems	Kingspan
Structural engineering	R G Carter
Building physics	Andrew Fisher www.qodaconsulting.com
Passive House project planning	Andrew Fisher www.qodaconsulting.com
Construction management	Carter Homes

Certifying body

WARM
www.peterwarm.co.uk

Certification ID

UK-NR59 ID:5427	Project-ID (www.passivehouse-database.org) Projekt-ID (www.passivhausprojekte.de)

Author of project documentation

Passivhaus Institut Darmstadt
www.passiv.de

Date Datum	Signature Unterschrift
20.05.2021	

1. Elevations

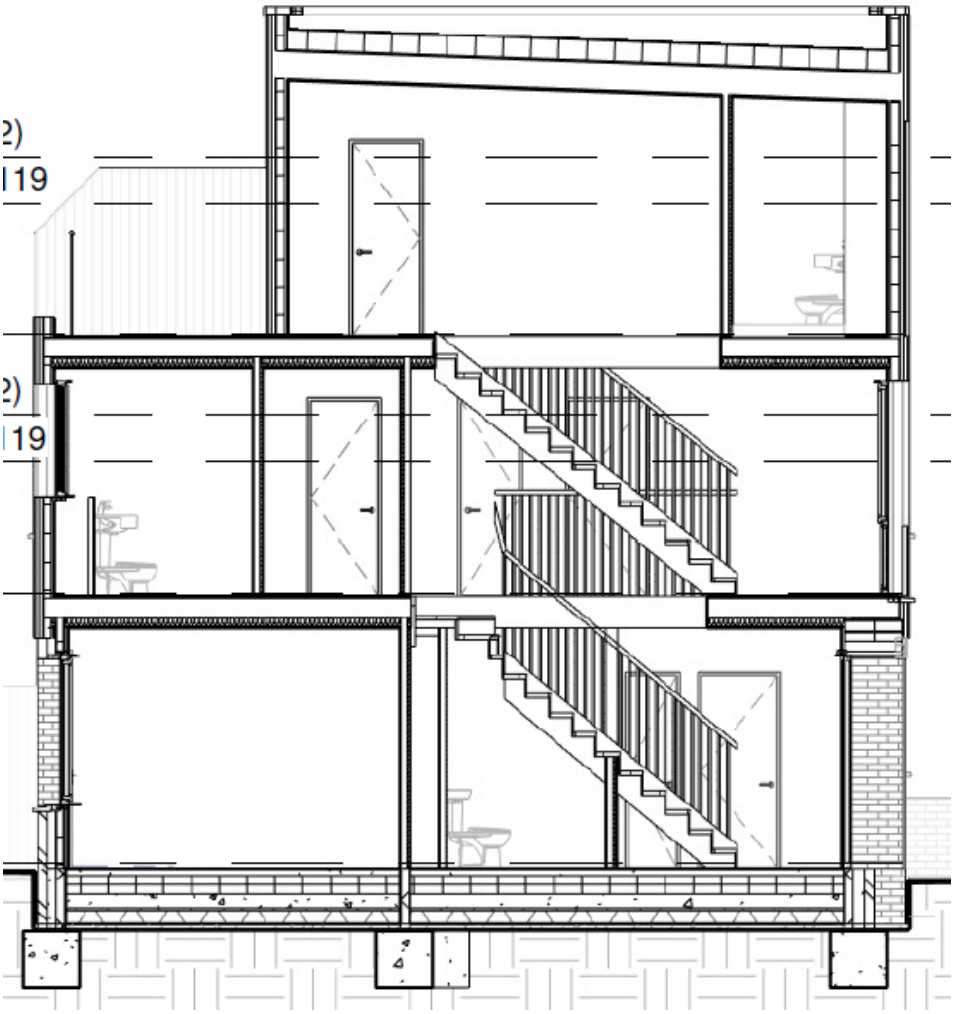
North

West

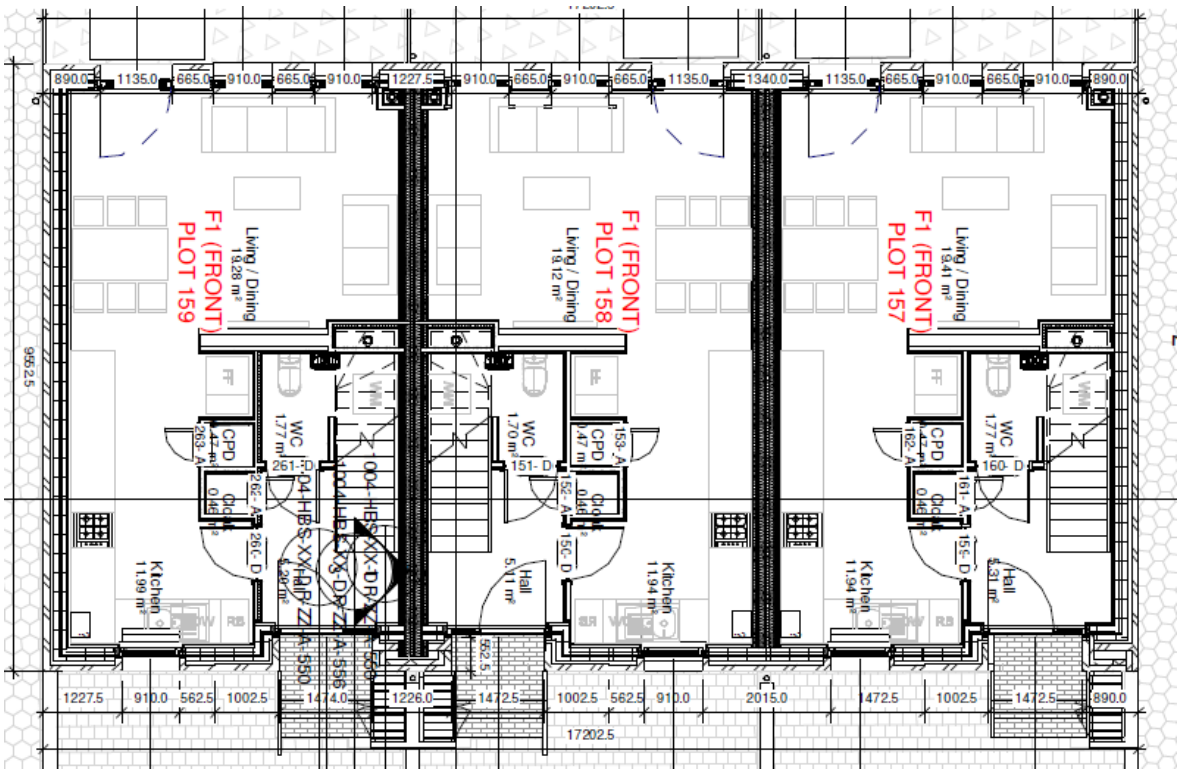
South

East

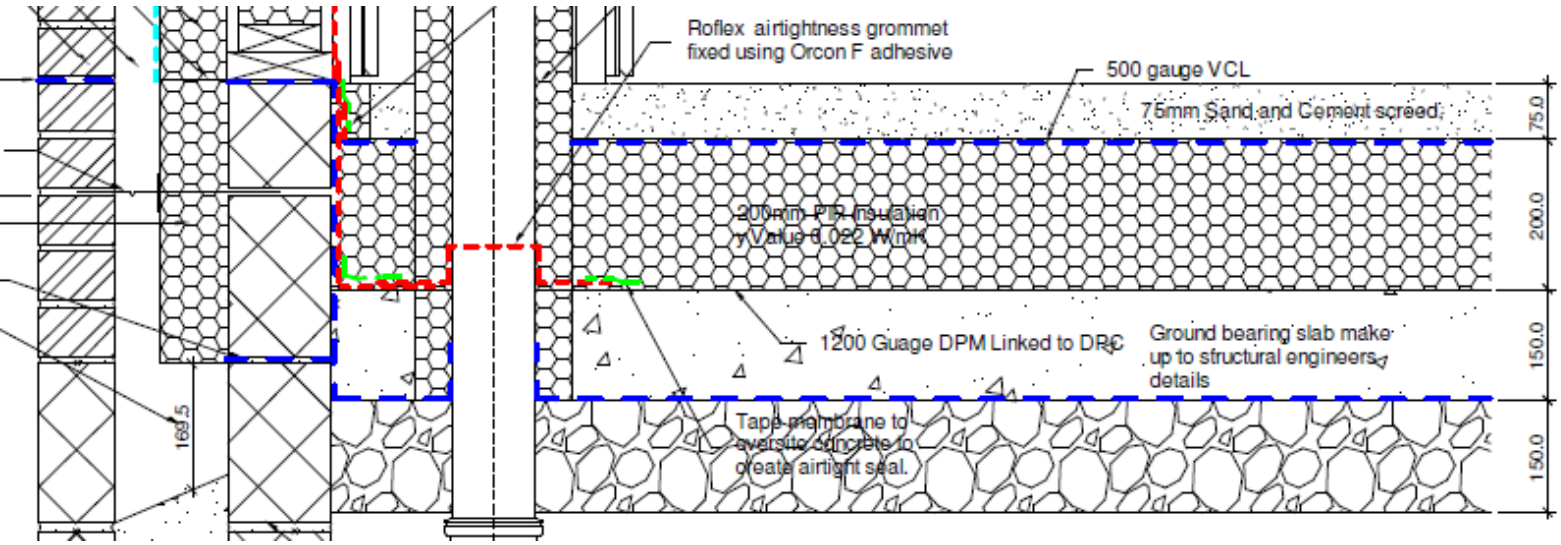
3. Sectional Drawing



4. Floor Plans (Ground)



5. Ground Floor Construction.



Here is the Ground Floor, including the External Wall Junction. The Ground Floor is a Ground Bearing Slab.

Assembly no.	Building assembly description					Interior insulation?
01ud	**Ground Floor**					

Heat transmission resistance [m²K/W]

Orientation of building element	**3-Floor**	interior R_{si}	0.17
Adjacent to	**2-Ground**	exterior R_{se}:	0.00

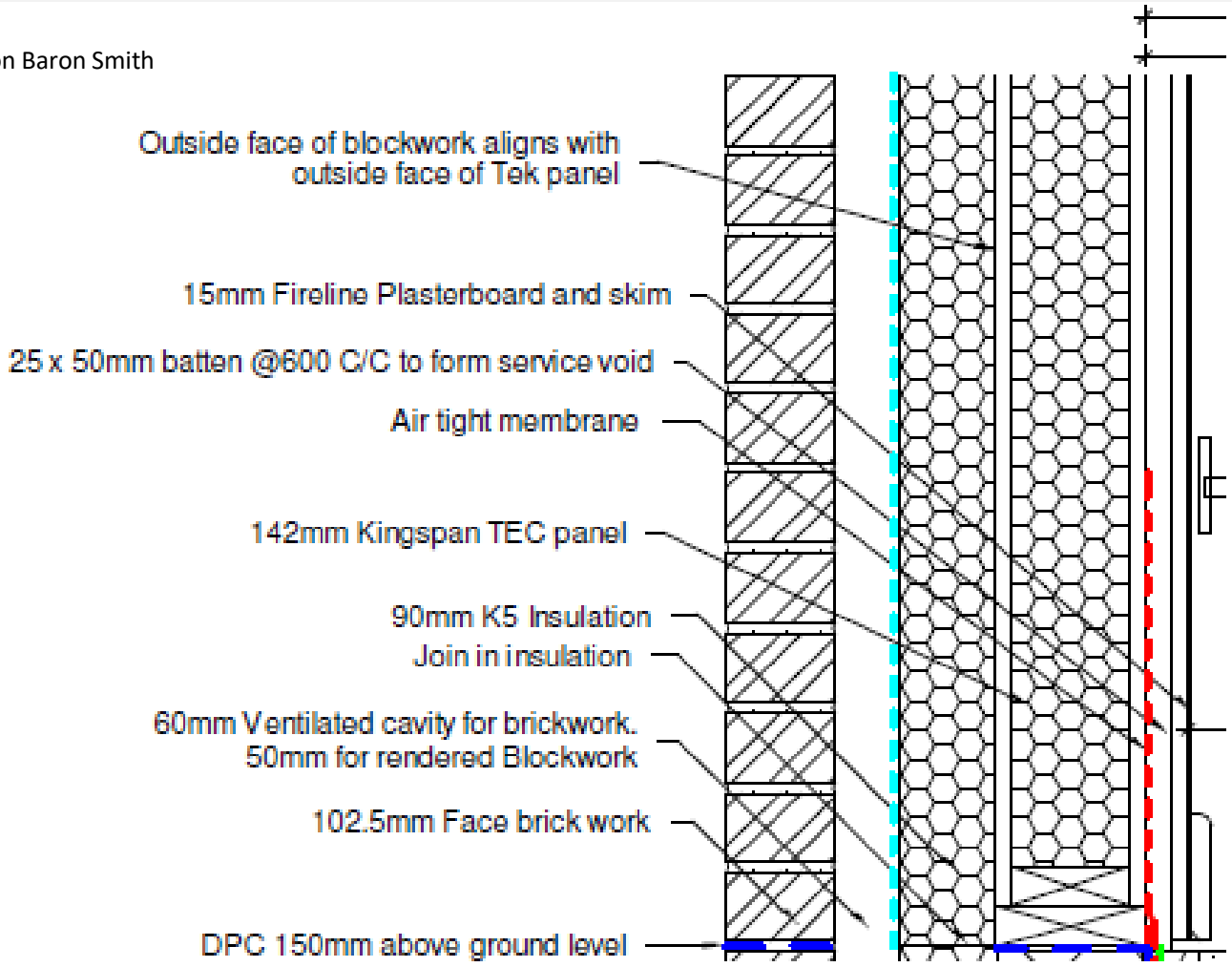
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Structural Slab	**1.300**					**150**
Celotex XR4000	**0.022**					**200**
Screed	**1.150**					**75**

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			**42.5** cm

U-value supplement [ ] W/(m²K)

U-value: 0.106 W/(m²K)

6. External Wall Construction



Here we see the External Wall with a Brick Finish. The U-Value Calculation was the same for Brick and Timber Clad as the Cavity was treated as 'ventilated' in both cases. Note wall ties ommited from this drawing (U-Value Supplement)

Assembly no. | Interior insulation?

03ud	Wall Type 4 - SIP (Kingspan)	

Heat transmission resistance [m²K/W]

Orientation of building element: 2-Wall — interior R_{si}: 0.13

Adjacent to: 1-Outdoor air — exterior R_{se}: 0.04

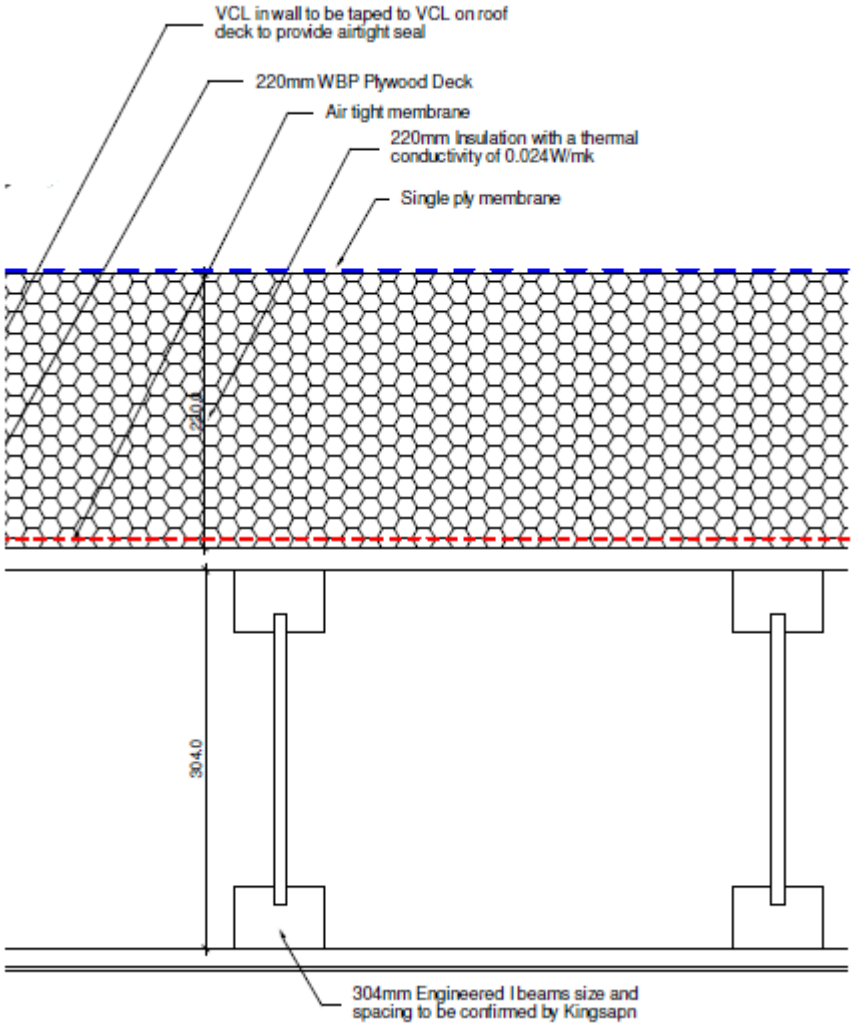
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
BRICKWORK						
VENTED CAVITYT						
Kingspan kooltherm K5	0.020					90
OSB	0.130					15
SIP Panel PU Core	0.024	Timber	0.130			112
OSB	0.130					15
Unvented Service Void	0.180					25
Plasterboard	0.250					13

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
82%	18.0%	0.0%	27.0 cm

U-value supplement: 0.03 W/(m²K)

U-value: 0.147 W/(m²K)

7. Roof Construction



The roof was a Warm Roof Construction Type with the Insulation above the Structural I Beams. Note the Air Tight Layer above the Structural I Beams also.

Assembly no.						Interior insulation?
04ud	Flat roof					

Heat transmission resistance [m²K/W]

Orientation of building element	1-Roof	interior R_{si}	0.10
Adjacent to	1-Outdoor air	exterior R_{se}:	0.04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Kingspan TR27 120 (0.024)	0.024					120
Kingspan TR27 100 (0.025)	0.025					100
Plywood	0.130					15
Service void	1.400	Timber	0.130			70
Plasterboard	0.250					25

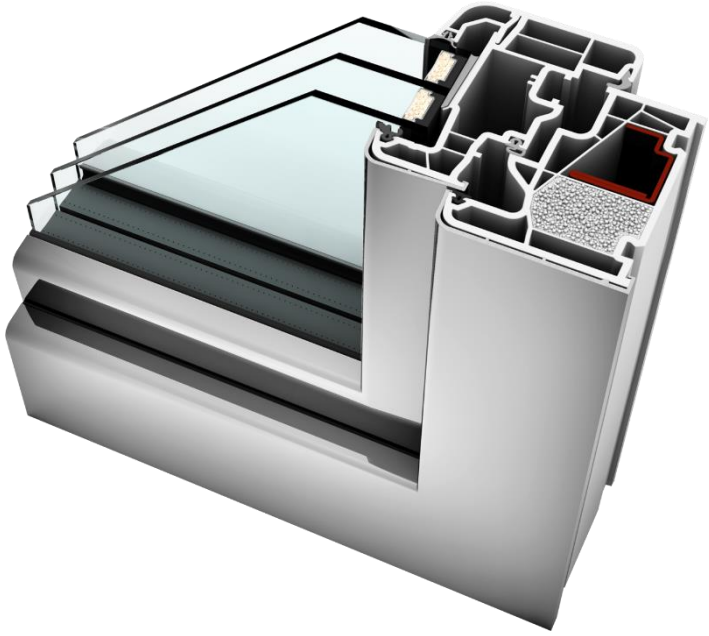
Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
85%	15.0% !		33.0 cm

U-value supplement _____ W/(m²K)

U-value: 0.106 W/(m²K)

8. Fenster und Fenster-Einbau

Internorm KF410 Window



Manufacturer	**Internorm**
Product	KF410/AT310
Frame U-Value Uf	0.85 W/(m²K)
Type of Glazinf	4b | 18Ar | 4 | 18r | b4
Glass U-Value Ug	0.525 – 0.649 W/(m²K)
Glass G Value G	0.51-0.54

Internorm Glazing U Value Calculation Method

CE

performance declaration

Identification number	4348732
Use	Window and door systems for use in residential and non-residential housing without compliance to fire protection and/or smoke resistance.
Harmonized norm	EN 14351-1:2006 + A1: 2010
Notified bodies	ift Rosenheim GmbH Notified Body No.: 0757 TU Graz Notified Body No.: 2064 PfB GmbH & Co Notified Body No.: 1644
Manufacturer	Internorm Ganglgutstraße 131 A-4050 Traun/Austria
Authorised by	./.

Declared performance windows/window doors

System to assess performance characteristics: 3

Final PHPP Glass G Values and U-Values

01ud	3T6 IL 4btoughened/18Ar/4/18Ar/b4toughened (0.5W/m²K, 34dB) (3T6-IL_) Default	0.54	0.549
02ud	3LW IL 4b/18Ar/4/18Ar/b4toughened (0.5W/m²K, 34dB) (3LW-IL)	*0.54*	0.525
03ud	3N2 IL 4b/18Ar/4/18Ar/b4 (0.5W/m²K, 34dB) (3N2-IL_),	0.54	0.549
04ud	3N3 IL 4btoughened/18Ar/4toughened/18Ar/b4toughened (0.5W/m²K, 34dB) (3N3-IL_),	0.54	0.549
05ud	AT310 Panel	0.00	0.530
06ud	3GM	0.51	0.560
07ud	34R (obscured)	0.43	0.520
08ud	48Y	0.504	0.547
09ud	*3HT*	*0.51*	*0.649*

9. Description of the airtight envelope

During Construction a total of two Air Tests per plot were carried out as par of the forecnsic testing and final result on completion.

Plot Number	Air Test Results – Ave. 50 Pa n_{50} h^{-1}
Plot 16	0.885
Plot 18	0.895
Plot 20	0.865

Building Average = 0.89 @ 50 Pa [n_{50}] h^{-1}

Concept Air Tightness

Floor Slab: Concrete (Primed and Taped to Walls.
Walls: Protect BarriAir.
Roof: Bauder Air Tigness Membrane.
Window Connection: Siga Tape.
Penetrations: Intello Grommets and Tescon Vana.

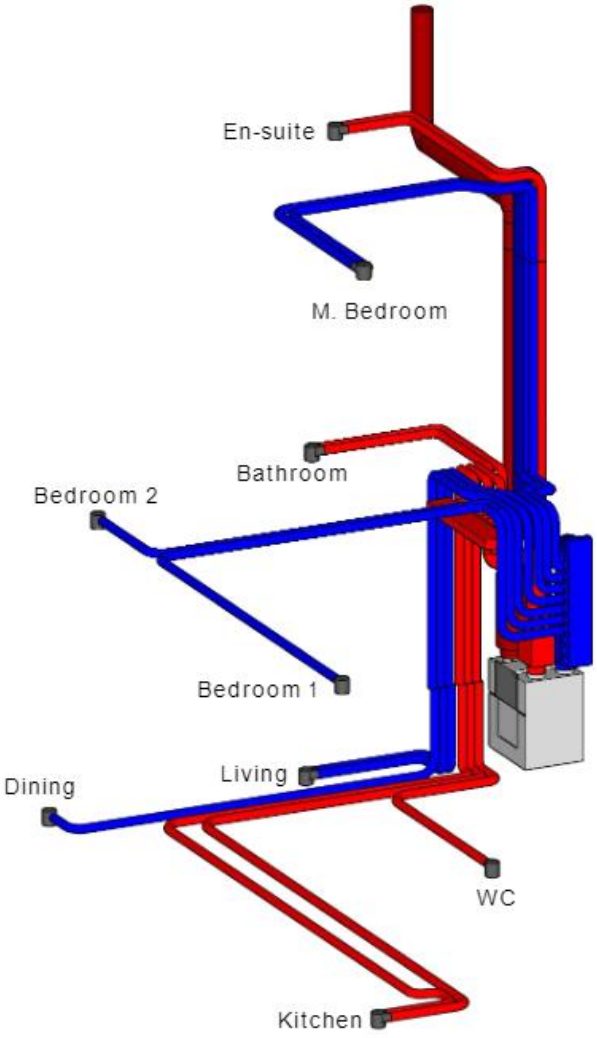
10. Ventialtion

In order to greatly reduce ventilation losses, a balanced supply / exhaust air system with a highly efficient counterflow air-to-air heat exchanger was used.

Zehnder ComfoAir Q350

Manufacturer	**Zehnder Group Nederland B.V.**
Heat Recovery Rate	91 %
Specific Electric Power	0.24 Wh/m³

11. Ventilation Planning



Note, This is the design for 1 of the plots only. All others identical, if handed.

Exhaust Air Rooms are Kitchen, Bathrooms, WC and Ensuites. **Supply Air Rooms** are Bedrooms and Lounge

The overflow occurs through overflow grilles in the interior doors in the hallway and the stairwell. From there through overflow openings above the doors into the damp rooms. From here, the used air is brought back to the heat exchanger via an exhaust duct network (in red on the diagram on the left).

12. Heat Supply & Renewable Technology

Heating and Hot water is provided by a Mains Gas Combination Boiler, with radiators for Heat Distribution. Each plot has individual Time and Temperature Zone Control for improved efficiency.

There are no 'Renewable' technologies used in these buildings and they are exceeding the minimum UK building Regulations (Part L1a) using the Fabric Efficiencies and MVHR alone.

13. Construction Cost

Construction Cost is not publiscised by the Contractor or Client as the is confidentail and commercially sensitive.

14. Literature

- [AkkP 5] Energiebilanz und Temperaturverhalten – mit Messergebnissen aus dem Passivhaus Darmstadt Kranichstein; Protokollband Nr. 5 des Arbeitskreises kostengünstige Passivhäuser, 1. Auflage, Passivhaus Institut, Darmstadt 1997
- [AkkP 13] Energiebilanzen mit dem Passivhaus Projektierungs Paket; Protokollband Nr. 13 des Arbeitskreises kostengünstige Passivhäuser, 1. Auflage, Passivhaus Institut, Darmstadt 1998
- [Ebel/Feist 1997] Witta Ebel und Wolfgang Feist: "Ergebnisse zum Stromverbrauch im Passivhaus Darmstadt Kranichstein" in "Stromsparen im Passivhaus"; Protokollband Nr. 7 zum Arbeitskreis Kostengünstige Passivhäuser; PHI; Darmstadt, 1997.
- [Feist 1988] Forschungsprojekt Passive Häuser; Projektziele - mit einem Kommentar des Autors zur 2. Auflage 1995, Institut Wohnen und Umwelt, Darmstadt, 1. Aufl. 1988, 2. Aufl. 1995
- [Feist 1993] Passivhäuser in Mitteleuropa; Dissertation, Universität Kassel, 1993
- [Feist/Werner 1994] Wolfgang Feist und Johannes Werner: "Gesamtenergiekennwert < 32 kWh/(m²a)"; Bundesbaublatt 2/1994
- [Feist 1997a] Wolfgang Feist, Tobias Loga: "Vergleich von Messung und Simulation" in "Energiebilanz und Temperaturverhalten"; [AkkP 5]; PHI; Darmstadt, Januar 1997.
- [Feist 1997b] Wolfgang Feist: "Der Härtetest: Passivhäuser im strengen Winter 1996/97"; GRE-Inform, 12/1997.
- [Feist 1997c] Wolfgang Feist: "Passivhaus Darmstadt Kranichstein - Planung, Bau, Ergebnisse", Fachinformation PHI 1997/4, 1. Auflage, 16 Seiten,
- [Feist 2000] Wolfgang Feist: "Erfahrungen objektiv: Messergebnisse aus bewohnten Passivhäusern"; in: Tagungsband zur 4. Passivhaus Tagung. Passivhaus Dienstleistung GmbH, 1. Auflage, Darmstadt 2000
- [PHPP 2007] Feist, W.; Pfluger, R.; Kaufmann, B.; Schnieders, J.; Kah, O.: Passivhaus Projektierungs Paket 2007, Passivhaus Institut Darmstadt, 2007
- [Rohrmann 1994] Bernd Rohrmann: "Sozialwissenschaftliche Evaluation des Passivhauses in Darmstadt"; Passivhaus-Bericht Nr. 11; Institut Wohnen und Umwelt; Darmstadt, September 1994.

15. PHPP

PHI Low Energy Building Verification

Building:	No 16, 18 and 20		
Street:	Three Score, Bowthorpe		
Postcode/City:	NR5	Norwich	
Province/Country:	Norfolk	GB-United Kingdom/ Britain	
Building type:	Housing		
Climate data set:	GB0013a-Hemsby		
Climate zone:	3: Cool-temperate	Altitude of location:	40 m
Home owner / Client:	Norwich Regeneration Ltd		
Street:	City Hall, St Peters Street		
Postcode/City:	NR2 1NH	Norwich	
Province/Country:	Norfolk	GB-United Kingdom/ Britain	

Architecture:	Hamson Barron Smith		
Street:	Townshend House, 30 Crown Road, Norwich		
Postcode/City:	NR1 3DT	Norwich	
Province/Country:	Norfolk	GB-United Kingdom/ Britain	
Energy consultancy:	Enhabit		
Street:	The Enterprise Centre, University of East Anglia		
Postcode/City:	NR4 7TJ		
Province/Country:	Norfolk	GB-United Kingdom/ Britain	

Mechanical system:	ALH Building Services Ltd		
Street:	Green Ridge, Littlefields		
Postcode/City:	NR19 1BQ	Dereham	
Province/Country:	Norfolk	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	

Year of construction:	2020	Interior temperature winter [°C]:	20.0	Interior temp. summer [°C]:	25.0
No. of dwelling units:	3	Internal heat gains (IHG) heating case [W/m²]:	2.6	IHG cooling case [W/m²]:	2.6
No. of occupants:	7.6	Specific capacity [Wh/K per m² TFA]:	60	Mechanical cooling:	

Specific building characteristics with reference to the treated floor area

				Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area m²	330.0				
Space heating	Heating demand kWh/(m²a)	23.61	≤	30	-	yes
	Heating load W/m²	12.22	≤	-	-	
Space cooling	Cooling & dehum. demand kWh/(m²a)	-	≤	-	-	-
	Cooling load W/m²	-	≤	-	-	
	Frequency of overheating (> 25 °C) %	3	≤	10		yes
	Frequency excessively high humidity (> 12 g/kg) %	0.27	≤	20		yes
Airtightness	Pressurization test result n_{50} 1/h	0.89	≤	1.0		yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	115.87	≤	120		yes
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	93.09	≤	-	-	-
	Generation of renewable energy kWh/(m²a)		≥	-	-	

[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.

PHI Low Energy Building? yes

Task:	First name:	Surname:	Signature:
2-Certifier	Michaek	Roe	

Certificate ID	Issued on:	City:
27948-27950_WARM_LEB_20200907_PW	01/09/20	Plymouth