Project Documentation
Gebäude-Dokumentation

1. Abstract | Zusammenfassung

Double attached family house, Te Miro, Waikato, New Zealand

1.1 Data of building
Gebäudedaten

Year of construction / Baujahr	2018 / 2019	**Space heating / Heizwärmebedarf**	**15 kWh/(m²a)**
U-value external wall / U-Wert Außenwand	0.244 W/(m²K)	Primary Energy Renewable (PER) Erneuerbare Primärenergie (PER)	45.3 kWh/(m²a)
U-value floor slab U-Wert Kellerdecke	0.183 W/(m²K)	Non-renewable Primary Energy (PE) Nicht erneuerbare Primärenergie (PE)	105.7 kWh/(m²a)
U-value roof U-Wert Dach	0.138 W/(m²K)	Pressurisation test n_{50} Druktest n_{50}	0.2/h-1
U-value window U-Wert Fenster	1.20 W/(m²K)	Heat recovery Wärmerückgewinnung	65% & 85%

2. Brief Description

Passive House Te Miro

The Te Miro eHaus project commenced on site on 20th June 2018 and was completed on 10th July 2019 and achieving certification on December 19th 2019.

The client brief was a contemporary, modern style home suitable for a family of 4 plus father in law to combined new home, with semi separate win for him to suit his needs. Set in the rolling hills of Te Miro, this home is in fact two homes in one. A separate but joined apartment provides all of the comforts for one generation including two bedrooms, an extensive library and a study. Then on the other side of the door another home that has everything a growing family needs. Including 3 bedrooms downstairs, an open plan dining living kitchen and then a master bedroom upstairs with a separate lounge and craft room. The attention to detail that has been employed has resulted in a very high quality home that not only looks good but performs very well. Timber frame has been used for the wall structure with a vertical cladding proving the weather tightness and exterior finish. The glazed element represents 28% of the wall area which assists with maintaining a cool internal temperature in the summer in this warm temperate southern hemisphere climate. The combined treated floor area is 322.2m² and the calculations for the PHPP and airtightness testing recognise the building as a single entity. There is an interconnecting single level kitchen and scullery that can be used as a shared space but then the space decides into two spacious homes that are quite private from each other.

Kurzbeschreibung

Passivehaus Te Miro

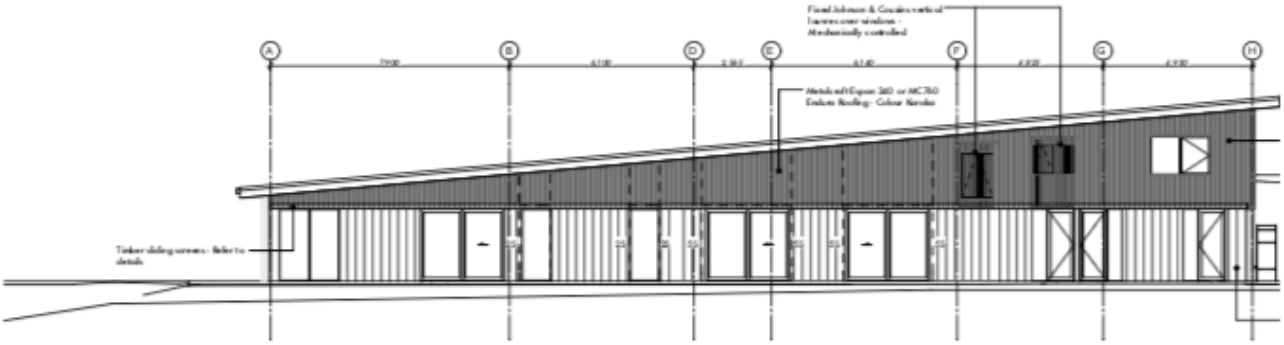
Das Projekt Te Miro eHaus begann am 20. Juni 2018 vor Ort und wurde am 10. Juli 2019 abgeschlossen und am 19. Dezember 2019 zertifiziert.

Der Kundenauftrag war ein zeitgemäßes, modernes Haus, das für eine vierköpfige Familie plus Schwiegervater geeignet war, um ein neues Zuhause zu kombinieren, mit einem halbseparierten Gewinn, der seinen Bedürfnissen entsprach. In den sanften Hügeln von Te Miro gelegen, besteht dieses Haus aus zwei Häusern in einem. Eine separate, aber verbundene Wohnung bietet allen Komfort für eine Generation, darunter zwei Schlafzimmer, eine umfangreiche Bibliothek und ein Arbeitszimmer. Dann auf der anderen Seite der Tür ein anderes Haus, das alles hat, was eine wachsende Familie braucht. Darunter 3 Schlafzimmer im Erdgeschoss, eine offene Wohnküche und ein Hauptschlafzimmer im Obergeschoss mit separatem Wohn- und Bastelraum. Die Liebe zum Detail hat zu einem sehr hochwertigen Haus geführt, das nicht nur gut aussieht, sondern auch eine sehr gute Leistung erbringt. Für die Wandstruktur wurde ein Holzrahmen mit einer vertikalen Verkleidung verwendet, die die Wetterdichtigkeit und die Außenbeschaffenheit beweist. Das verglaste Element macht 28% der Wandfläche aus, was dazu beiträgt, im Sommer in diesem warmen, gemäßigten Klima der südlichen Hemisphäre eine kühle Innentemperatur aufrechtzuerhalten. Die kombinierte behandelte Grundfläche beträgt 322,2 m², und die Berechnungen für die PHPP- und Luftdichtheitsprüfung erkennen das Gebäude als eine Einheit an. Es gibt eine miteinander verbundene einstöckige Küche und eine Spülküche, die als gemeinsamer Raum genutzt werden können. Dann entscheidet sich der Raum in zwei geräumige Häuser, die recht privat voneinander sind.

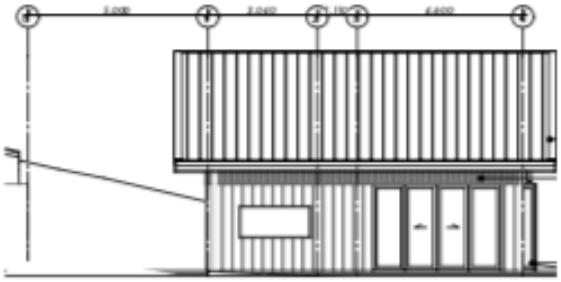
3. Responsible project participants
Verantwortliche Projektbeteiligte

Architect Entwurfsverfasser	Grant Johnson www.ehaus.co.nz
Implementation planning Ausführungsplanung	Grant Johnson www.ehaus.co.nz
Structural engineering Baustatik	Ljupco Petreski Creative Structures Ltd
Building physics Bauphysik	Maria Rei www.ehaus.co.nz
Passive House project planning Passivehaus-Projektierung	Maria Rei www.ehaus.co.nz
Construction management Bauleitung	eHaus Waikato - Brown Constructions www.ehaus.co.nz
Certifying body **Zertifizierungsstelle**	Jason Quinn - Sustainable Engineering Ltd www.sustainableengineering.co.nz
Certification ID **Zertifizierungs ID**	**6267** www.passivehouse-database.org
Author of project documentation **Verfasser der Gebäude-Dokumentation**	Maria Rei www.ehaus.co.nz
Date 25th June, 2020 Datum	Signature Unterschrift 

4. Elevations

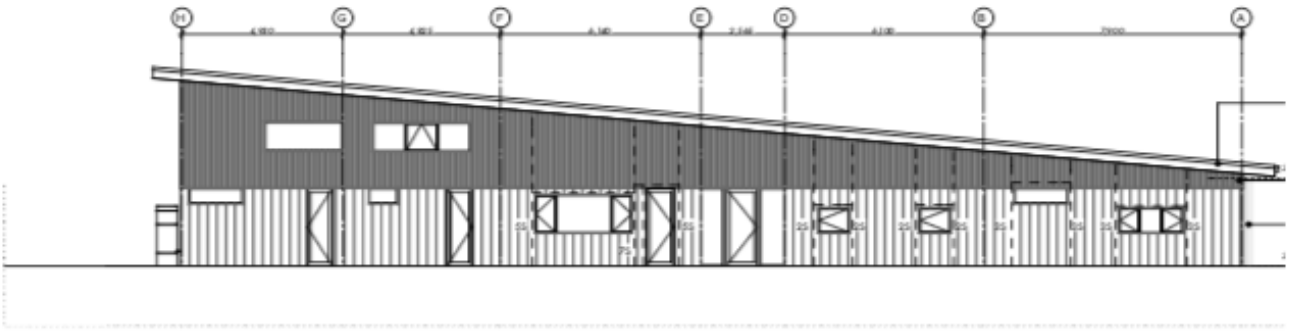


1
-
West Elevation
1:100

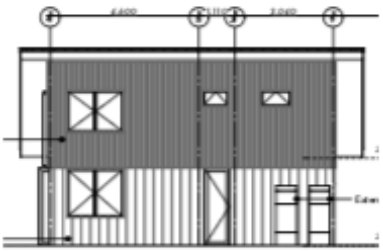


3
-
North Elevation
1:100

North-west view



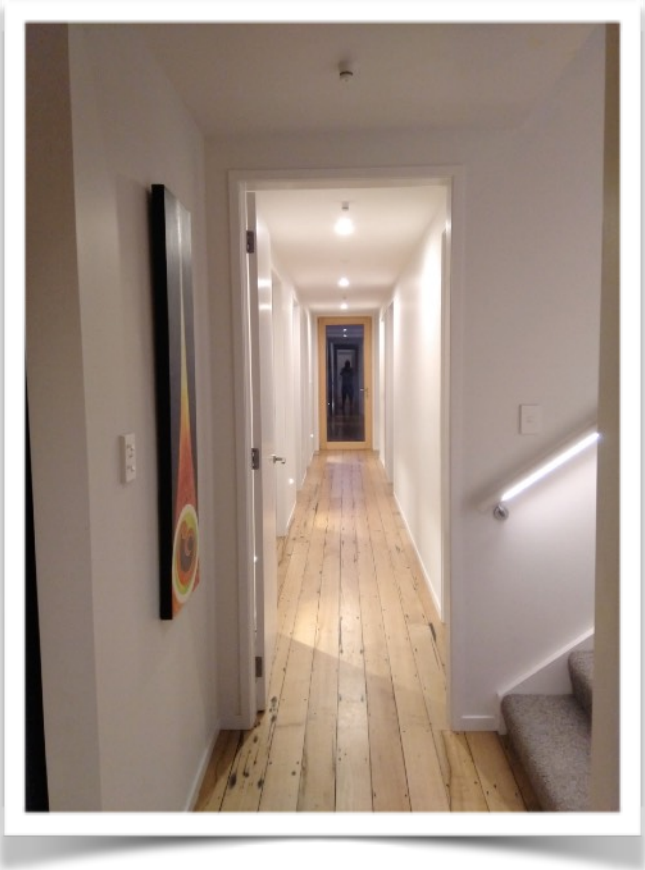
2
-
East Elevation
1:100

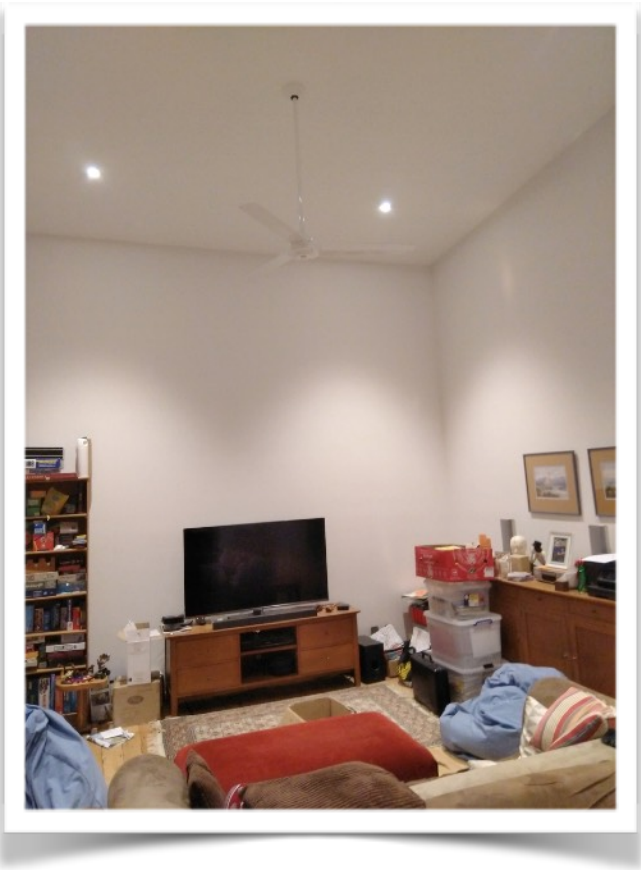


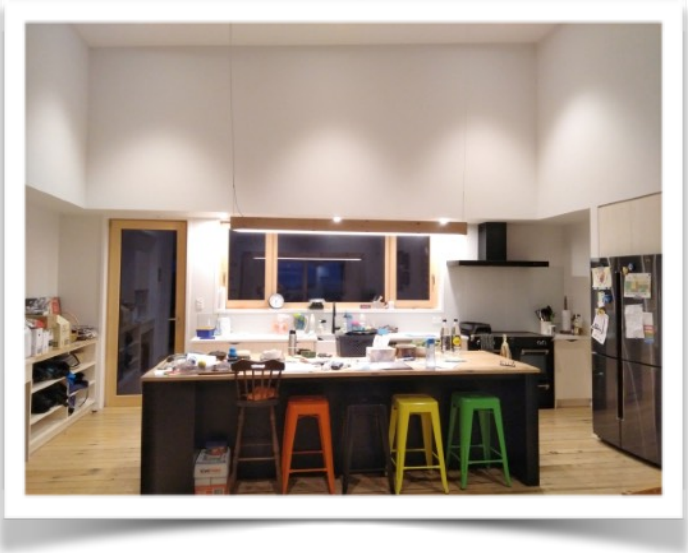
4
-
South Elevation
1:100

South-east view

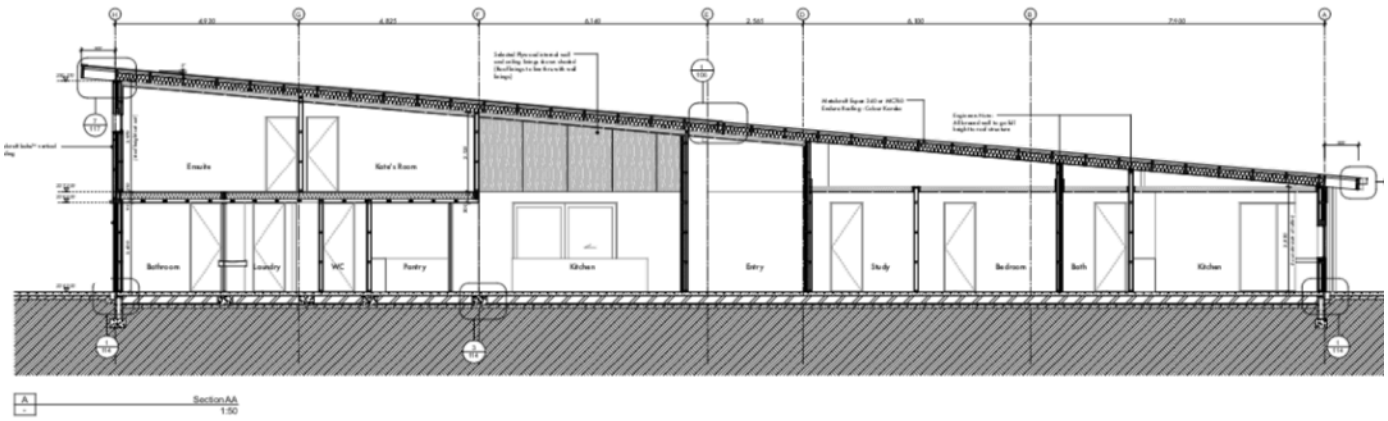
5. Internal pictures



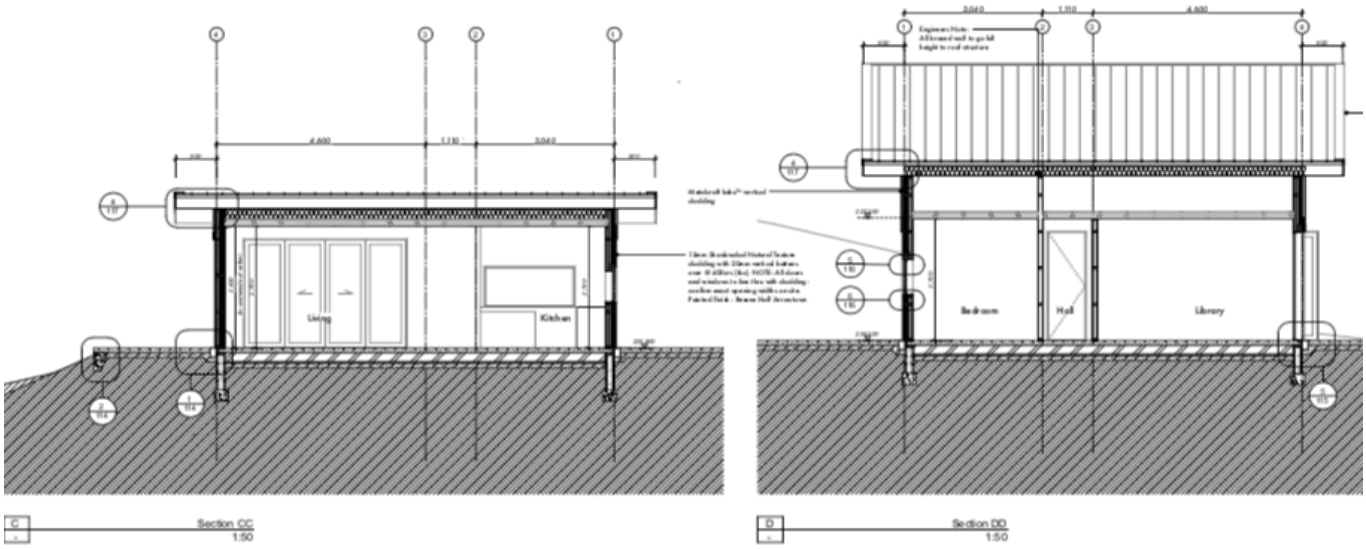




6. Cross sections



Section A-A

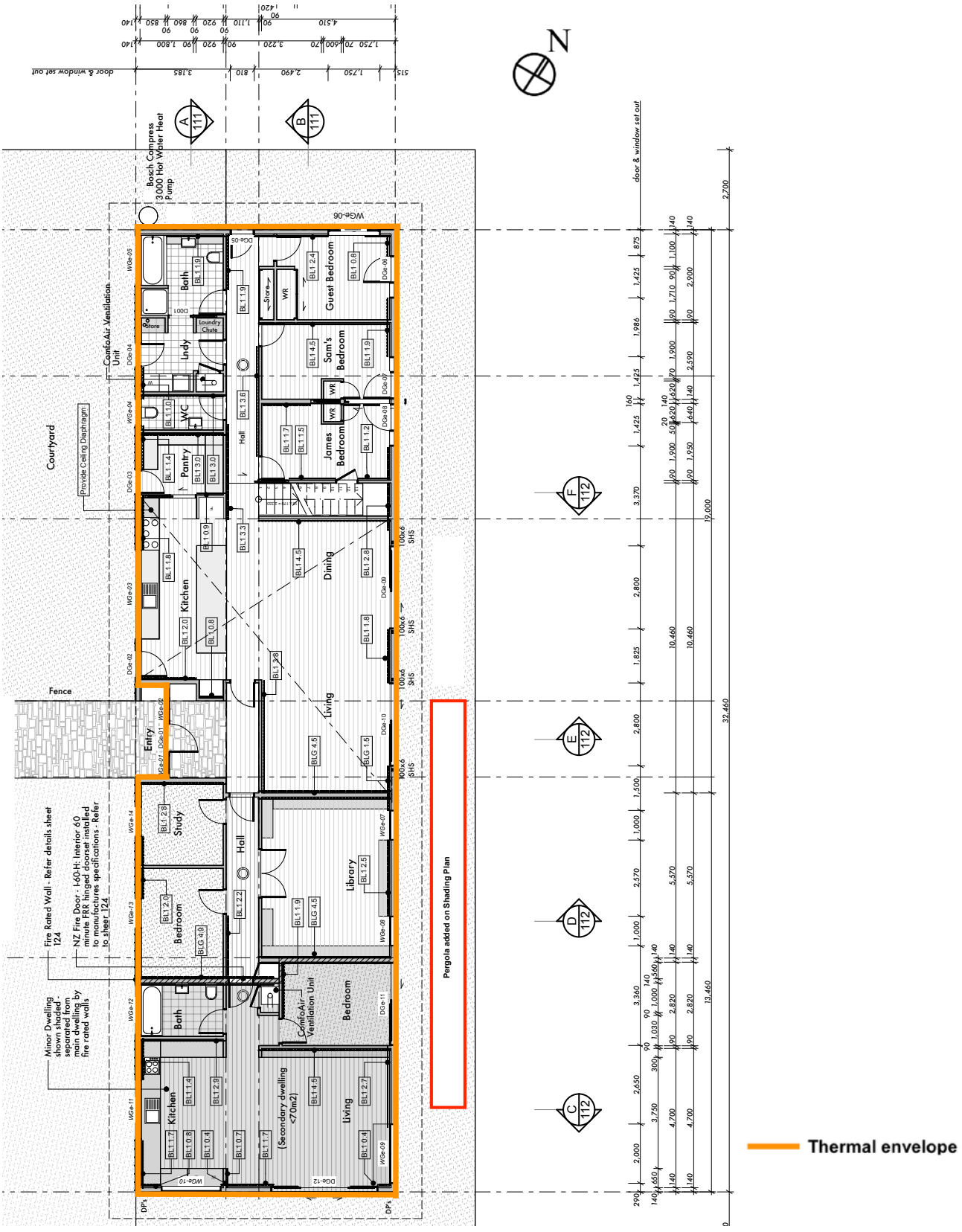


Section C-C

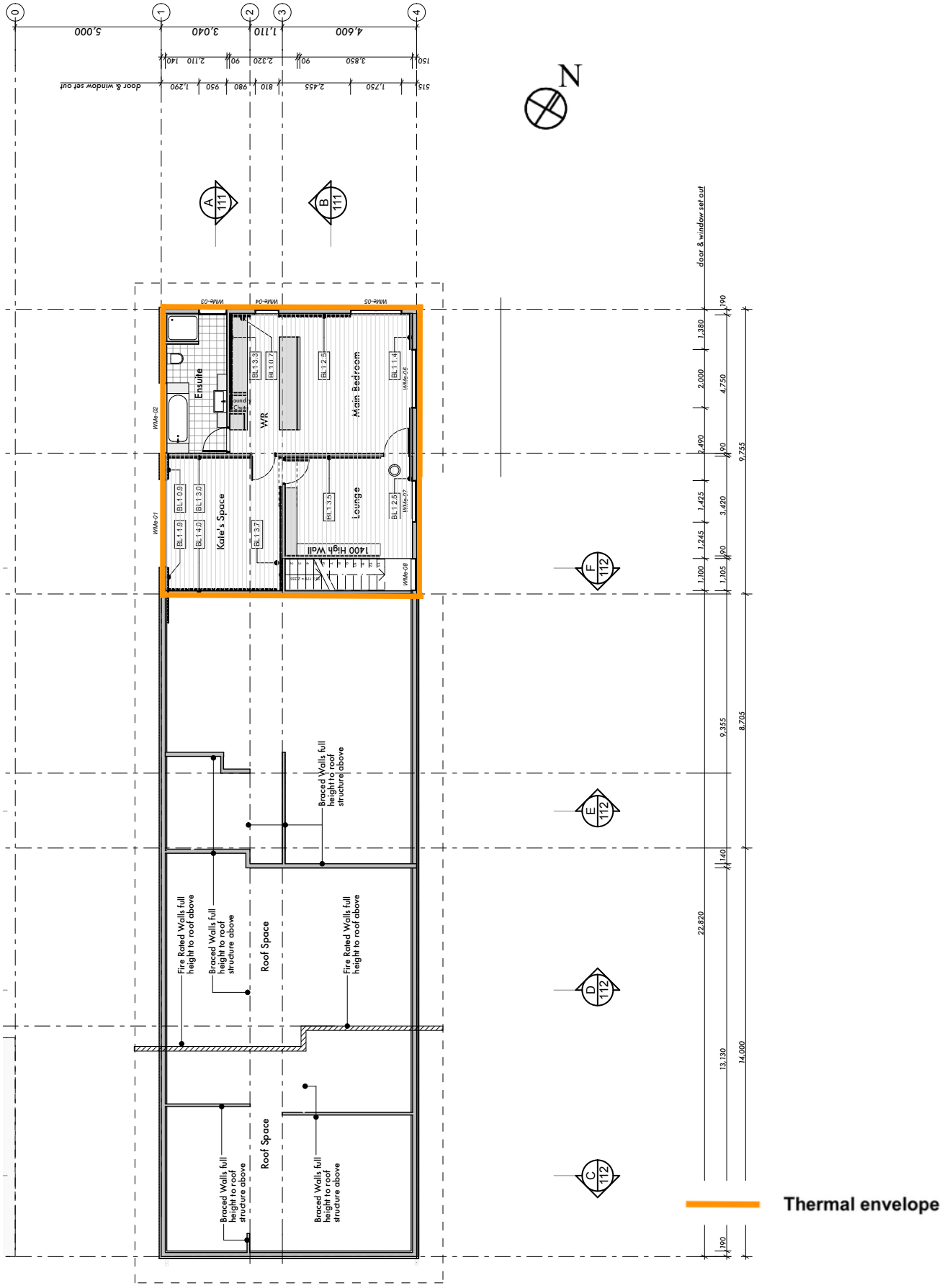
Section D-D

7. Floor Plans

Ground floor with Treated Floor Area marked



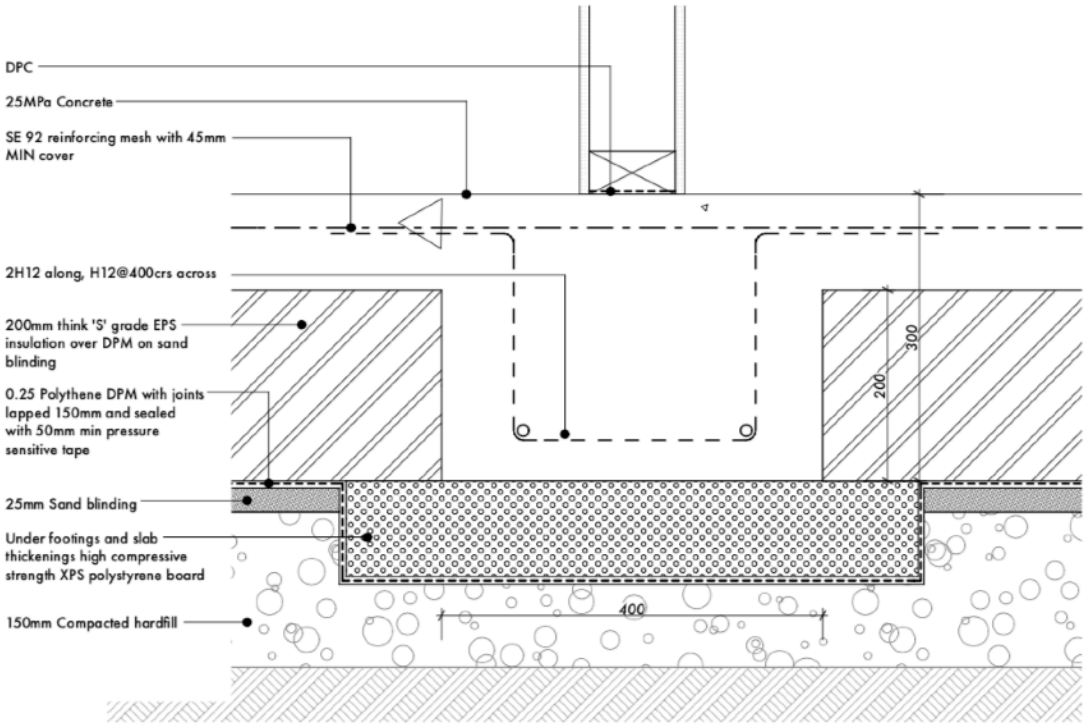
Mezzanine floor with Treated Floor Area marked



8. Construction details

8.1 Footing and Slab

The U-value of the floor slab achieved is 0.183W/(m²K) specifying a thickness of 200mm EPS (R5.2) under the concrete pad. These level of insulation will meet the performance required for the Passive House Standard.



Assembly no.						Interior insulation?
04ud	Floor Pad					

Heat transmission resistance [m²K/W]

Orientation of building element: 0.17 — interior R_{si}: 0.17

Adjacent to: 0 — 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]
S grade EPS Polyfoam	0.038					200
Reinforced Concrete	2.400					100

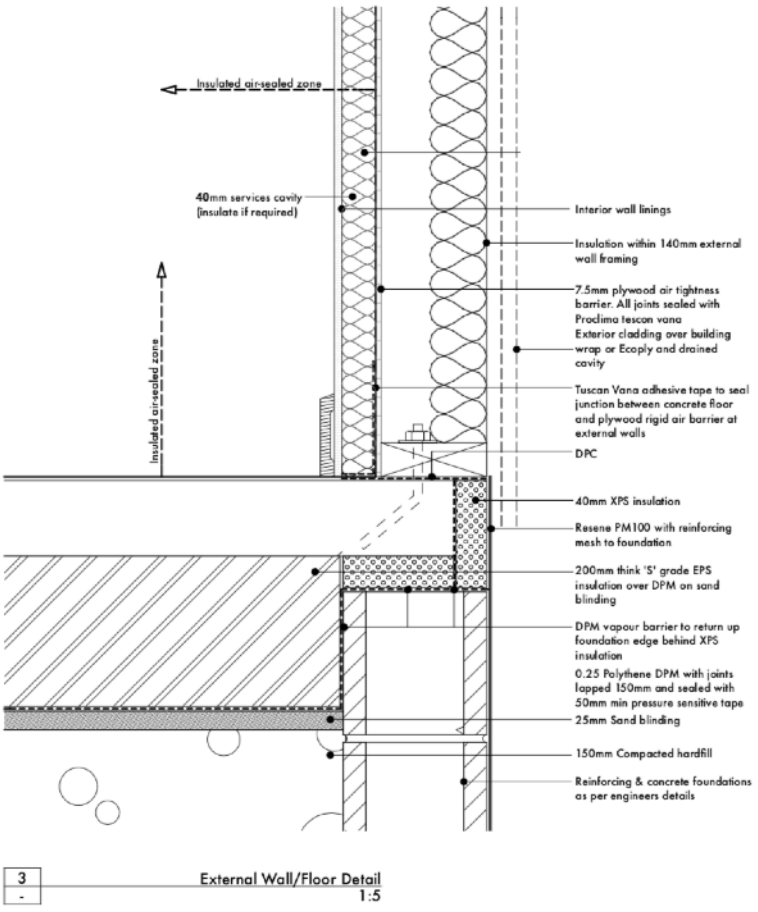
Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			30.0 cm

U-value supplement: W/(m²K)

U-value: 0.183 W/(m²K)

8.2 Exterior Walls

For the exterior walls have selected a 140mm framework with insulation in between (140mm R4.0) and then a taped or glued plywood sheet to provide an air tightness layer and then a service cavity of 40mm on the inside to provide an additional layer of insulation (40mm R1.0) to minimise the thermal bridging. The U-value achieved is 0.244 W/(m²K).



Assembly no.	Building assembly description	Interior insulation?
01ud	Timber frame 140-45	

Heat transmission resistance [m²K/W]

Orientation of building element	0.13	interior R_{si}	0.13
Adjacent to	0.13	exterior R_{se}	0.13

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
GiB	0.160					10
Pink Batts Ultra R1.0 Masonry Wall	0.040	compressed & metal	0.080			40
Ply	0.160					8
Pink Batts Ultra R4.0 140mm Wall	0.035	Woodframe	0.140			140

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
85%	15.0%		19.8 cm

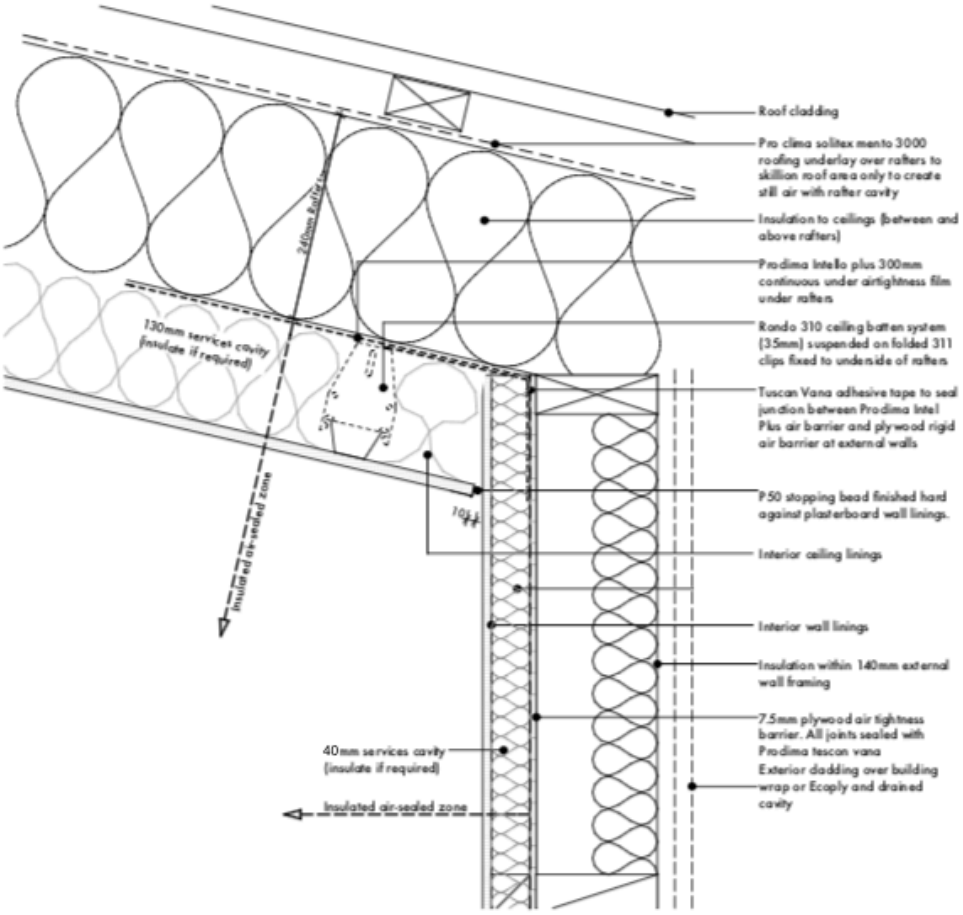
U-value supplement W/(m²K)

U-value: 0.244 W/(m²K)

Timber frame

8.3 Insulation of the Roof

The U-value of the roof of 0.138 W/(m²K) was achieved using two overlapping layers (220mm R5.0 and 115mm R3.2) of fibreglass insulation.



4 - External Wall/Raking Ceiling Detail 1:5

Assembly no.						Interior insulation?
09ud	Cathedral Ceiling - 220+115					

Heat transmission resistance [m²K/W]

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

Adjacent to: 0.13 — exterior R_{se}: 0.13

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
GiB	0.250					10
Service Cavity		Compressed Rondo				
Pink Batts Ultra R5.0 Ceiling	0.044	Timber	0.130			220
Pink Batts Skillion Roof R3.2 - 115mm	0.036	Timber	0.130			115

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
92%	8.4%		34.5 cm

U-value supplement: W/(m²K)

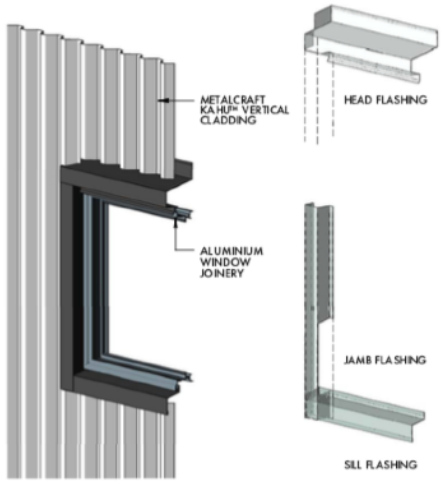
U-value: 0.138 W/(m²K)

Ceiling insulation

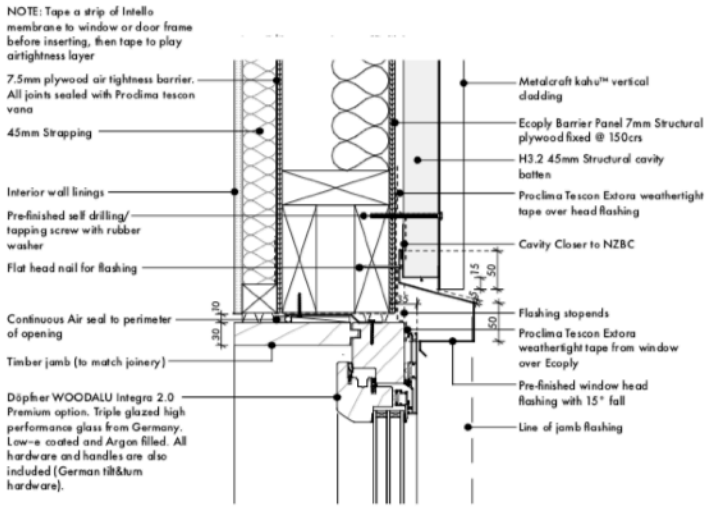
Ceiling insulation

8.4 Window installation details

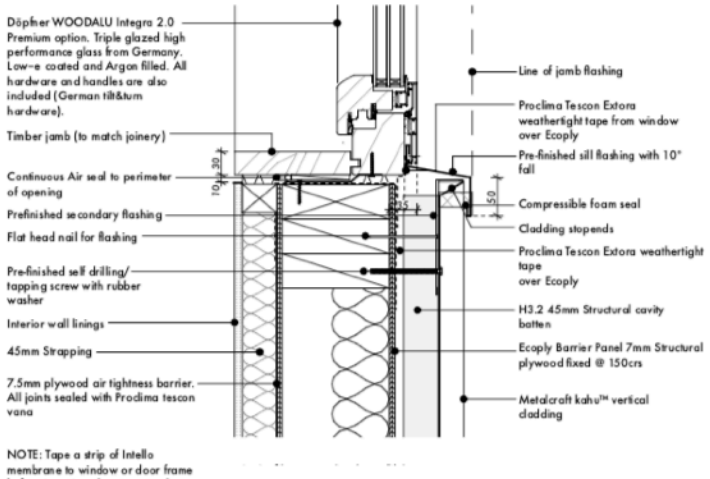
To achieve the passive house standard specific focus has been given to the window frames using high end German wood-alu joinery. Döpfner Premium IV78 with a U-value of 1.20 W/(m²K). Eco Windows is the New Zealand company that import and distribute these windows.
The glazing selected is a combination of Planitherm XN (4:16/4:/16/4 Ar 90%), Low E Argon triple glazing (Ug-value 0.57 W/(m²K) g-value 54 %) and Cool-Lite SKN 165, Argon triple glazing Low G (Ug-value 0.65 W/(m²K) g-value 31 %) to reduce the risk of overheating.
As an edge spacer was used Ultimate Swisspacer, with a Ψ-Value of 0.030 W/(mK).
Glazing and edge spacer by Saint-Gobain.



1 - Recessed Flashing Detail (Longrun) 1:5



2 - Window Head Detail (Longun) 1:5

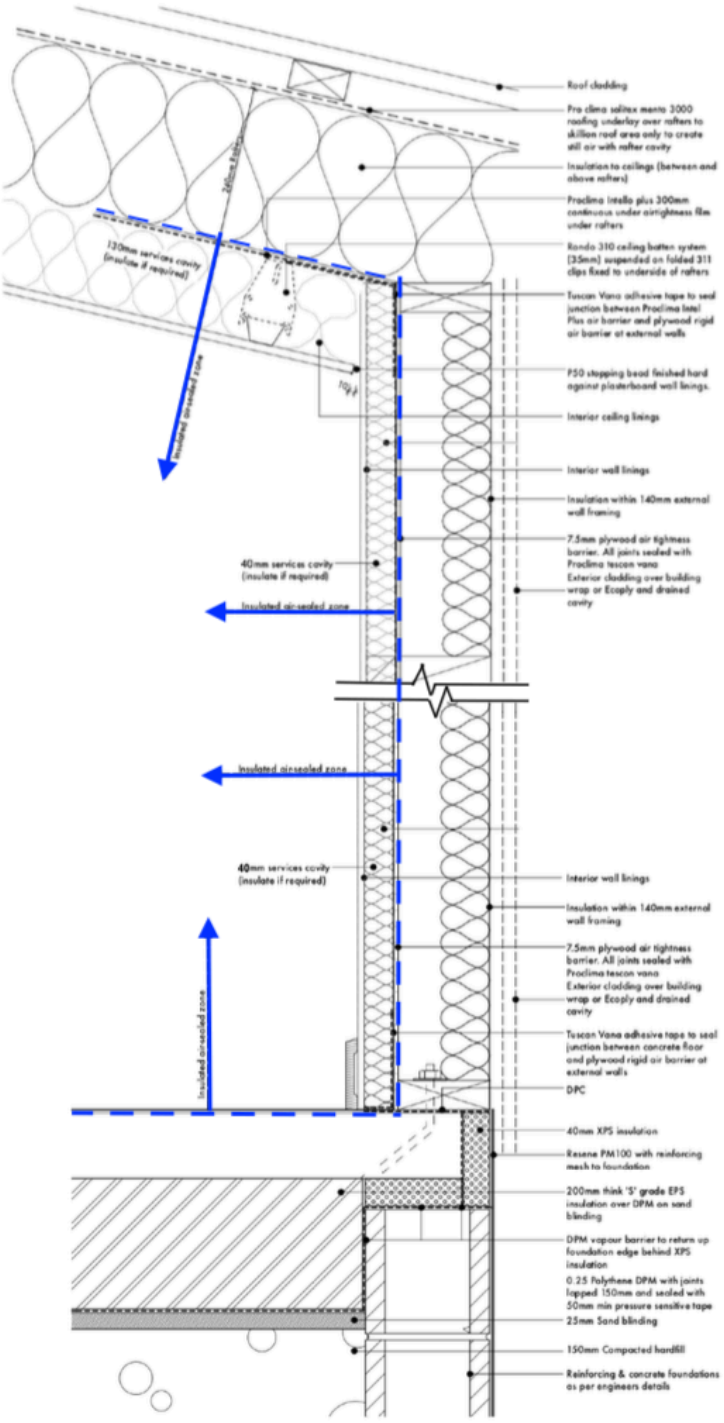


3 - Window Sill Detail (Longrun) 1:5

Windows installation

9. Airtightness and pressure test documentation

Using a concrete pad foundation and a timber frame wall structure simplifies the air tightness designation for this building. The roof wall junction airtightness was achieved with an airtightness membrane (Proclima Intello). Tapes and sealant were also used for the window installation.



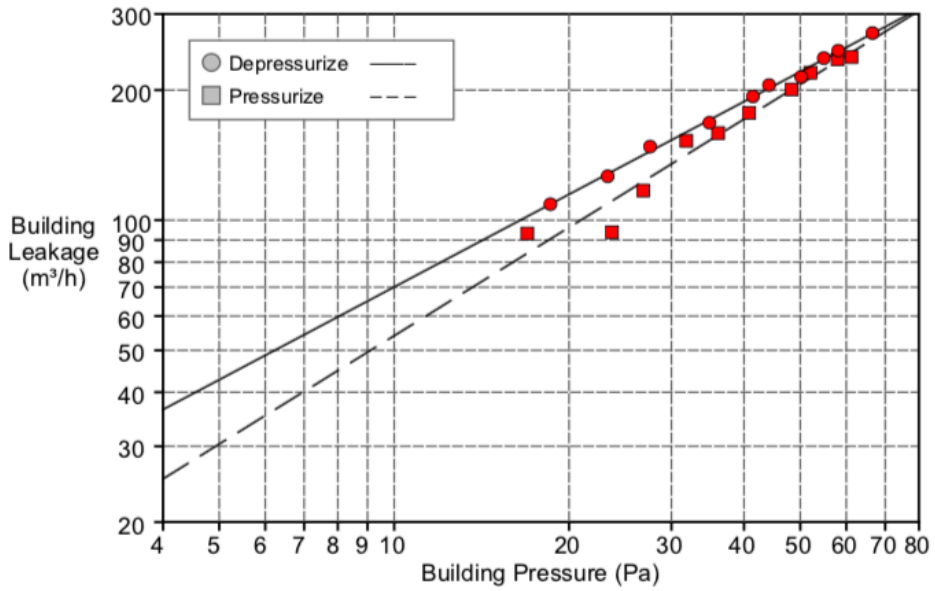
Airtightness Detail

Airtightness on ceiling

Ply airtightness on ceiling

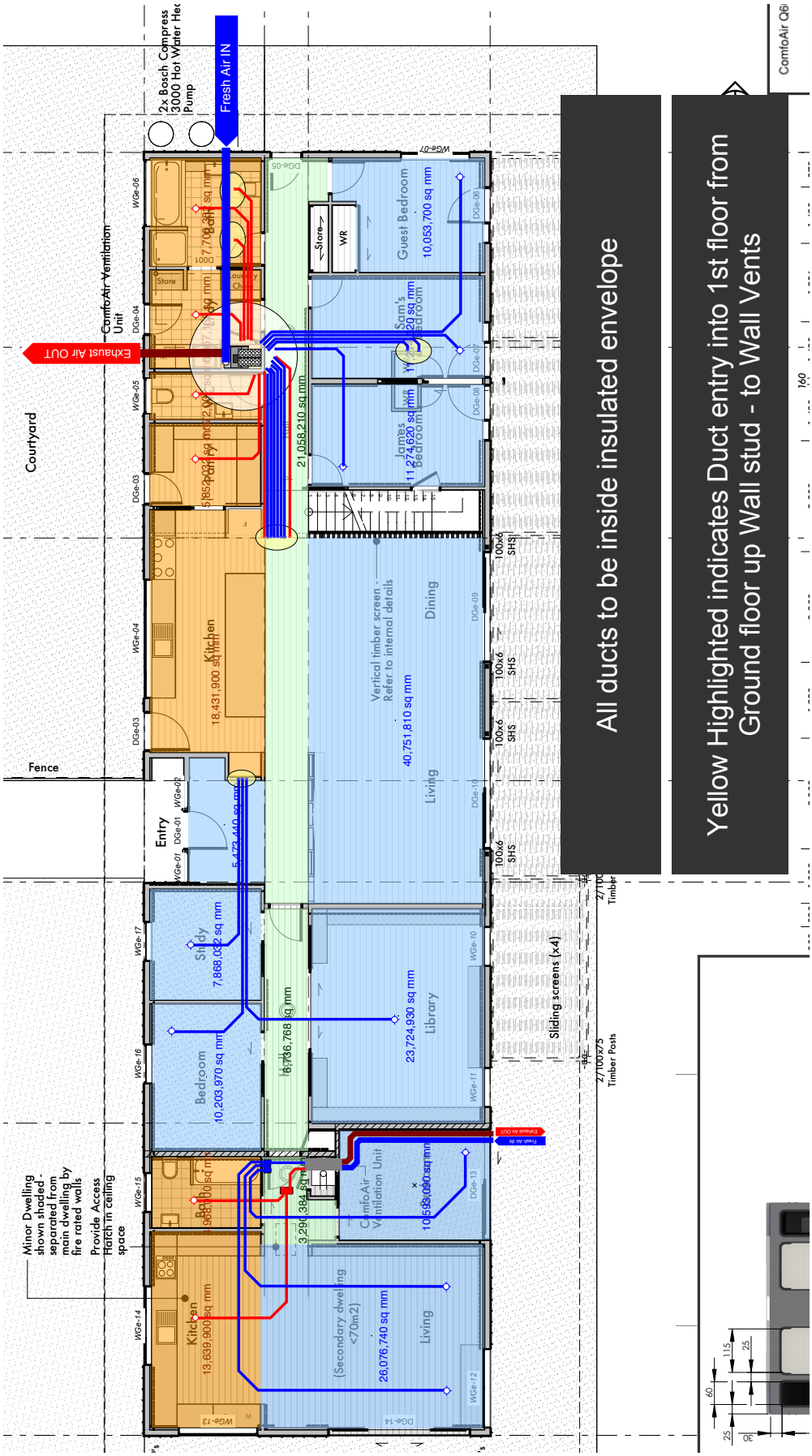
Result of the Airtightness Test

	Depressurization	Pressurization	Average
Test Results at 50 Pascals:			
V50: m³/h50 (Airflow)	221 (+/- 1.5 %)	206 (+/- 7.2 %)	213
n50: 1/h (Air Change Rate)	0.22	0.20	0.21
w50:			
q50:			
Leakage Areas:			
Canadian EqLA @ 10 Pa (cm²)	78.1 (+/- 4.5 %)	60.3 (+/- 19.5 %)	69.2
LBL ELA @ 4 Pa (cm²)	39.3 (+/- 7.3 %)	27.1 (+/- 32.2 %)	33.2
Building Leakage Curve:			
Air Flow Coefficient (Cenv) m³/(h·Paⁿ)	13.5 (+/- 11.6 %)	7.9 (+/- 51.8 %)	
Air Leakage Coefficient (CL) m³/(h·Paⁿ)	13.6 (+/- 11.6 %)	7.9 (+/- 51.8 %)	
Exponent (n)	0.713 (+/- 0.031)	0.833 (+/- 0.143)	
Correlation Coefficient	0.99854	0.97855	
Test Standard:	EN 13829		
Test Mode:	Depressurization and Pressurization		
Type of Test Method:	A		
Regulation complied with:	EN13829 n50 ≤ .6 1/h		

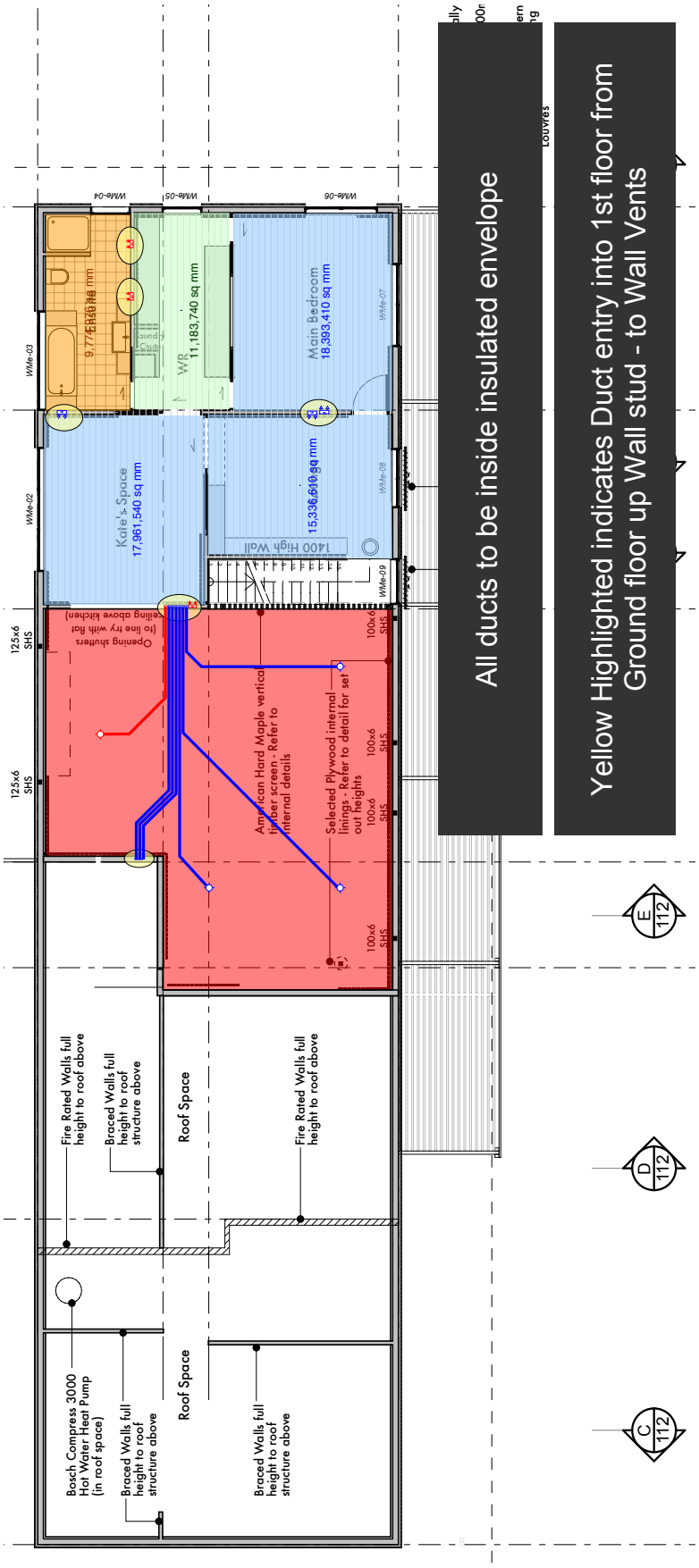


10. Ventilation units and system design

In this project two units were installed. On the main dwelling a Zehnder ComfoAir Q600 ST, a centralized, compact ventilation unit with heat recovery and integrated adaptive summer by-pass. With a heat recovery coefficient of 85%. The second unit (on the secondary dwelling) a Zehnder ComfoAir 180 heat recovery ventilation system is an ultra compact unit which is ideal for installation in kitchen cupboard. With a heat recovery coefficient of 65%.



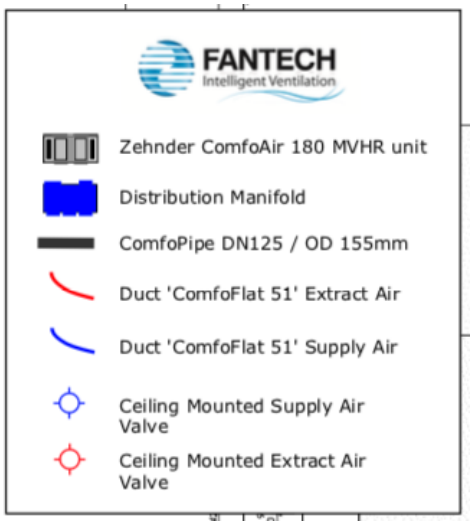
Ground floor plan

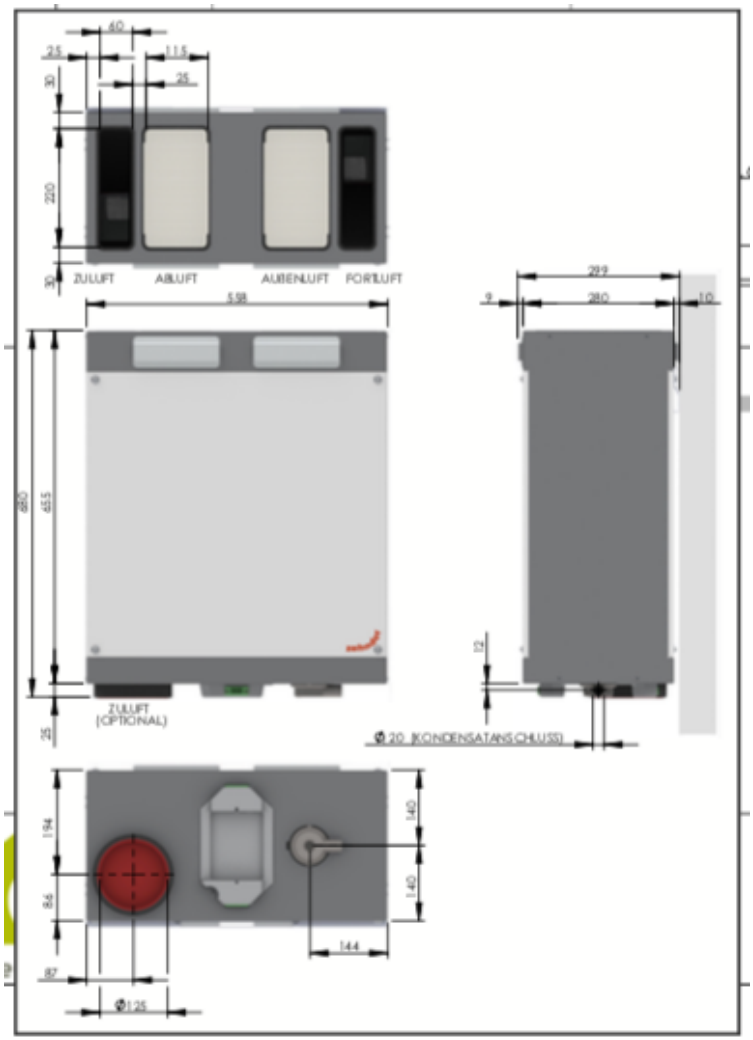


Mezzanine floor plan

FANTECH
Intelligent Ventilation

Zehnder Comfo Air 180





Notes:

Zehnder ComfoAir 180
fitted with ComfoWell attenuators.

Ducting to External:
Zehnder ComfoPipe
I/D = 125 mm
O/D = 155mm

Ducting to Internal:
Zehnder ComfoFlat 51mm all runs to be completely inside the insulated envelope

Internal Grilles: All ceiling and wall grilles. Indicated location is suggestion only for best practice.

External Grilles: Location to be confirmed - Zehnder Stainless steel with rodent mesh wall mounted.

Design is suggested only and does not resolve if space is available or not. Please check dimensions to ensure all will fit. Some co-ordination with the builder may be required to ensure installation is completed as required.

Plumbing connection required. Please add to the plumbing plan for plumber to complete and connect.

Electrician to supply and install matching switches to Bathrooms - Press Mech type.
Data cable to be run from Bathroom boost switches to the plant room.
Data cable to be run from control panel location (owner to direct) to the plant room also.

Quote does not include GST, FREIGHT and Installation Price

FANTECH
Intelligent Ventilation

Zehnder ComfoAir Q600 MVHR unit (fitted with ComfoWell Distribution Manifold / Noise Attenuator.

ComfoPipe DN160 / OD 190mm

Duct 'ComfoTube DN90' Extract Air

Duct 'ComfoTube DN90' Supply Air

Ceiling Mounted Supply Air Valve

Ceiling Mounted Extract Air Valve

Wall Mounted Supply Air Valve

Wall Mounted Extract Air Valve

Ducting transfer between levels via wall cavity space

Notes:

Zehnder ComfoAir Q600
fitted with ComfoWell attenuators.

Ducting to External:
Zehnder ComfoPipe
I/D = 180 mm
O/D = 210mm

Ducting to Internal:
Zehnder ComfoTube 90mm all runs to be completely inside the insulated envelope

Internal Grilles: All ceiling and wall grilles. Indicated location is suggestion only for best practice.

External Grilles: Location to be confirmed - Zehnder Stainless steel with rodent mesh wall mounted.

Design is suggested only and does not resolve if space is available or not. Please check dimensions to ensure all will fit. Some co-ordination with the builder may be required to ensure installation is completed as required.

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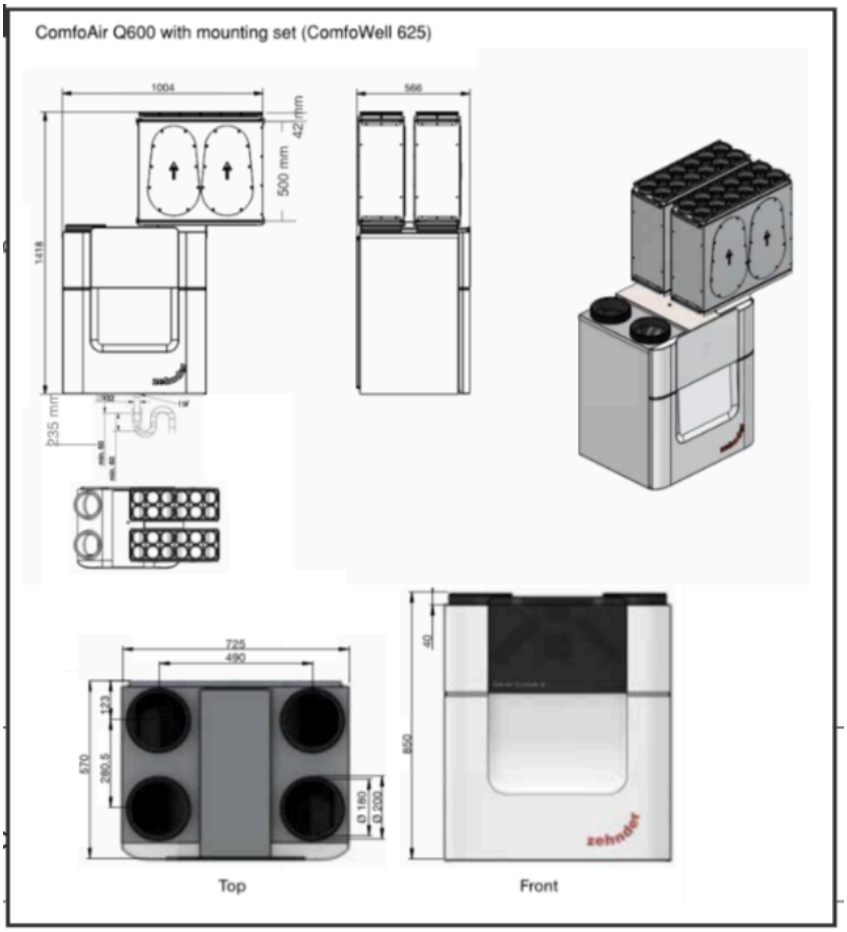
Zehnder ComfoAir Q600

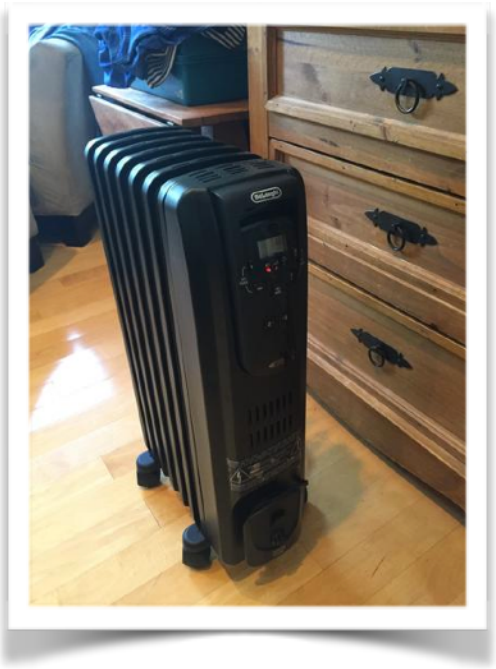


Zehnder ComfoAir 180 HRV unit installed on the secondary dwelling

Zehnder ComfoAir Q600 HRV unit installed on the main dwelling

11. Heat Supply

The heating requirement is supplied with the use of electric resistance heaters and three heated towel rails.



The hot water is provided via a Bosch 3000, 270L capacity, Outdoor Heat Pump water heater.

12. PHPP Results

Passive House Verification

Building:	Te Miro eHaus		
Street:			
Postcode/City:	3496		
Province/Country:	Waikato	NZ-New Zealand	
Building type:	Two-level residence		
Climate data set:	NZ0010a-Hamilton / Ruakura		
Climate zone:	4: Warm-temperate	Altitude of location:	224 m
Home owner / Client:	Grant and Kate Amos		
Street:			
Postcode/City:	3496		
Province/Country:	Waikato	NZ-New Zealand	

Architecture:	eHaus - Grant Johnson		
Street:	400 Victoria Avenue		
Postcode/City:	4500	Whanganui	
Province/Country:	Manawatu-Wanganui	NZ-New Zealand	
Energy consultancy:	eHaus - Maria Rei		
Street:	400 Victoria Avenue		
Postcode/City:	4500	Whanganui	
Province/Country:	Manawatu-Wanganui	NZ-New Zealand	

Mechanical engineer:	eHaus Waikato, Brown Construction		
Street:	45 Komak Road		
Postcode/City:	3791	Hamilton	
Province/Country:	Waikato	NZ-New Zealand	
Certification:	Sustainable Engineering Ltd		
Street:	76N Virginia Rd		
Postcode/City:	4500	Whanganui	
Province/Country:	Manawatu-Wanganui	NZ-New Zealand	

Year of construction:	2019	Interior temperature winter [°C]:	20.0	Interior temp. summer [°C]:	25.0
No. of dwelling units:	2	Internal heat gains (IHG) heating case [W/m²]:	2.4	IHG cooling case [W/m²]:	2.5
No. of occupants:	5.9	Specific capacity [Wh/K per m² TFA]:	84	Mechanical cooling:	

Specific building characteristics with reference to the treated floor area

					Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area	m²	322.2				
Space heating	Heating demand	kWh/(m²a)	15.0	≤	15	-	yes
	Heating load	W/m²	11.7	≤	-	10	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	-	≤	-	-	-
	Cooling load	W/m²	-	≤	-	-	
	Frequency of overheating (> 25 °C)	%	1.4	≤	10		yes
	Frequency of excessively high humidity (> 12 g/kg)	%	0.3	≤	20		yes
Airtightness	Pressurization test result n_{50}	1/h	0.2	≤	0.6		yes
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	105.7	≤	-		-
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	45.3	≤	60	60	yes
	Generation of renewable energy (in relation to projected building footprint area)	kWh/(m²a)	0.0	≥	-	-	

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

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

Passive House Classic? yes

Task:	First name:	Surname:	Signature:
2-Certifier	Jason	Quinn	

Certificate ID	Issued on:	City:
25137-25138_SENZ_PH_20191219_JEQ	19/12/2019	Whanganui

Project data imported from designPH 1.6.02 PHPP9 display.code: 370701157_201015_ZAZNZ_en09

The very good performance is due in part to the selected materials and also the favourable climate conditions. The airtightness result of 0.21ACHn50 also assists this result.
Overheating was minimised with the combination of low E Argon triple and low G Argon triple glazing.

The house has been designed to be low maintenance solid construction, all materials have been selected for aesthetic appeal and longevity. eHaus worked early in the design stage with the PHPP to ensure the design criteria was working from a performance perspective

13. Year of Construction and costs

The construction period commenced on site on 20th June 2018 and was completed on 10th July 2019 with final landscaping still in process. The final cost is not know as the owner wishes to be private

14. Owners experiences

One of the encouraging aspects of being involved in the Passive House industry is hearing the feedback from the clients.
When interviewed recently the owners said when asked what is it like living in an eHaus: *" Our experience with the house has been very positive. The air quality is extremely good with pollen removed from the air. There is no mould, dust or condensation in the house. This all makes for comfortable and healthy living."*

15. Available Research Material / Publications

The project is one of the projects included in a case study of Sustainable Engineering Ltd.
https://sustainableengineering.co.nz/casestudy/te-miro-ehaus/