Project Documentation
Gebäude-Dokumentation

1. Abstract | Zusammenfassung

Three Bedroom family home, Waikanae, Wellington, New Zealand

1.1 Data of building
Gebäudedaten

Year of construction / Baujahr	2015 / 2016	**Space heating / Heizwärmebedarf**	**14.3 kWh/(m²a)**
U-value external wall / U-Wert Außenwand	0.220 W/(m²K)	Primary Energy Renewable (PER) Erneuerbare Primärenergie (PER)	46 kWh/(m²a)

U-value floor slab U-Wert Kellerdecke	0.184 W/(m²K)	Non-renewable Primary Energy (PE) Nicht erneuerbare Primärenergie (PE)	107 kWh/(m²a)
U-value roof U-Wert Dach	0.159 W/(m²K) 0.126 W/(m²K)	Pressurisation test n_{50} Druktest n_{50}	0.5/h^{-1}
U-value window U-Wert Fenster	0.67 W/(m²K)	Heat recovery Wärmerückgewinnung	78%

2. Brief Description

Passive House Kapiti

This single level family home was built in 2015-2016 and was the first certified Passive House in the Wellington region. This was also one of the first projects in New Zealand using a 140 timber frame with an internal service cavity coupled with a double layer of fibreglass insulation. The floor is a fully insulated 100mm concrete pad with EPS underneath and wrapping the sides. The roof has a double layer of fibreglass insulation and air tightness is achieved with an air tight breathable membrane. With a significant glazed area to the north providing solar gain but also a large overhang giving protection in the summer months. Triple glazing was required in this instance to meet the internal temperature requirements when combined with the uPVC frame. There is only 3.8m2 of glazing to the west and even less to the east to minimise unwanted solar gain. The glazed element represents 22% of the wall area which assists with maintaining a cool internal temperature in the summer in this warm temperate southern hemisphere climate.. The treated floor area is 145.6m² and the calculations for the PHPP and air tightness testing recognise the building as a single entity that is separate from the garage. There is an interconnecting insulated and air tight door that leads into the garage. The home is built in a new residential area in this popular west coast region of New Zealand.

Kurzbeschreibung

Passivhaus Kapiti

Dieses einstöckige Einfamilienhaus wurde 2015-2016 gebaut und war das erste zertifizierte Passivhaus in der Region Wellington. Dies war auch eines der ersten Projekte in Neuseeland, bei dem ein 140-Holzrahmen mit einem internen Versorgungshohlraum in Verbindung mit einer doppelten Glasfaserisolierung verwendet wurde. Der Boden ist eine vollständig isolierte 100-mm-Betonplatte mit EPS darunter und Umhüllung der Seiten. Das Dach hat eine doppelte Glasfaserisolierung und die Luftdichtheit wird durch eine luftdichte, atmungsaktive Membran erreicht. Mit einer bedeutenden verglasten Fläche im Norden, die Sonneneinstrahlung bietet, aber auch einem großen Überhang, der in den Sommermonaten Schutz bietet. In diesem Fall war eine Dreifachverglasung erforderlich, um die Anforderungen an die Innentemperatur in Kombination mit dem Kunststoffrahmen zu erfüllen. Es gibt nur 3,8 m2 Verglasung im Westen und noch weniger im Osten, um unerwünschte Sonneneinstrahlung zu minimieren. Das verglaste Element macht 22 % der Wandfläche aus, was dazu beiträgt, in diesem warm-gemäßigten Klima der südlichen Hemisphäre im Sommer eine kühle Innentemperatur aufrechtzuerhalten. Die behandelte Bodenfläche beträgt 145,6 m² und die Berechnun-

gen für das PHPP und die Luftdichtheitsprüfung erkennen das Gebäude an als eine Einheit, die von der Garage getrennt ist. Es gibt eine isolierte und luftdichte Verbindungstür, die in die

Garage führt. Das Haus befindet sich in einem neuen Wohngebiet in dieser beliebten Westküstenregion Neuseelands.

3. Responsible project participants
Verantwortliche Projektbeteiligte

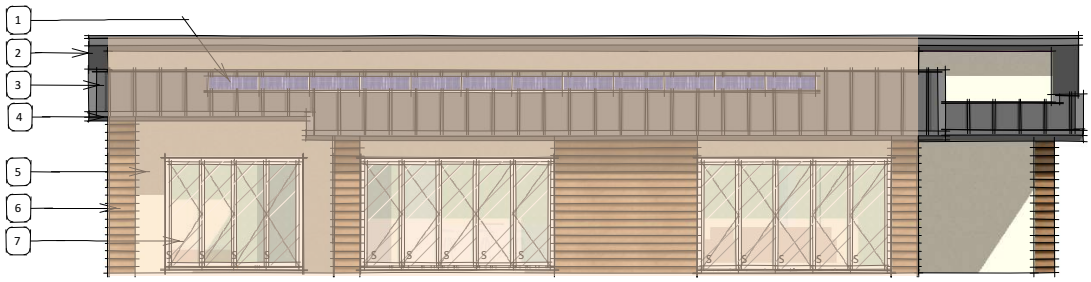
Architect Entwurfsverfasser	Ross Bennett www.ehaus.co.nz
Implementation planning Ausführungsplanung	Ross Bennett www.ehaus.co.nz
Structural engineering Baustatik	Ian Pearson Consulting Structural Engineer
Building physics Bauphysik	Jon Iliffe www.ehaus.co.nz
Passive House project planning Passivehaus-Projektierung	Jon Iliffe www.ehaus.co.nz
Construction management Bauleitung	eHaus Kapiti - Chris Beggs www.ehaus.co.nz
Certifying body **Zertifizierungsstelle**	Jason Quinn - Sustainable Engineering Ltd www.sustainableengineering.co.nz
Certification ID **Zertifizierungs ID**	**5162** www.passivehouse-database.org
Author of project documentation **Verfasser der Gebäude-Dokumentation**	Jon Iliffe www.ehaus.co.nz
Date 16th February, 2021 Datum	Signature Unterschrift 

4. Elevations

Thermal envelope

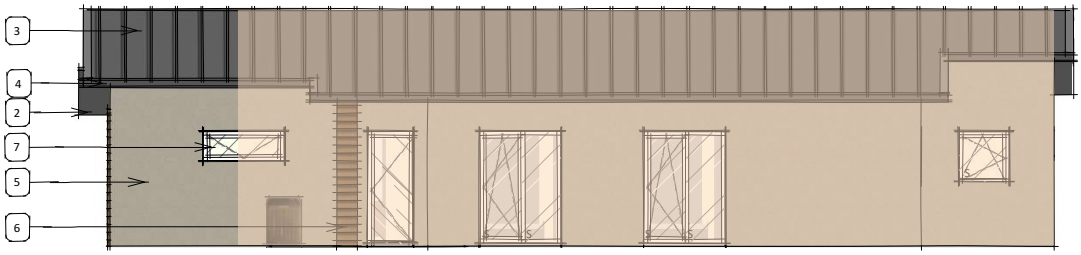
Notes

1. Solar PV Panels
2. 4.5mm James Hardie soffit linings with PVC jointers
3. 0.55 BMT Longrun colorsteel 'Solar-Rib' profile roofing over ThermaKraft Covertek 407 roofing underlay.
4. Colorsteel continuous metal spouting on ex 200 x 25 PP H3.1 fascia
5. Resene Construction System 50mm Integra Facade over drained cavity
6. 110mm cover Western Red Cedar BB Weatherboard over drained cavity
7. UPVC window joinery with double glazing
8. Western Red Cedar clad sectional overhead door (insulated)

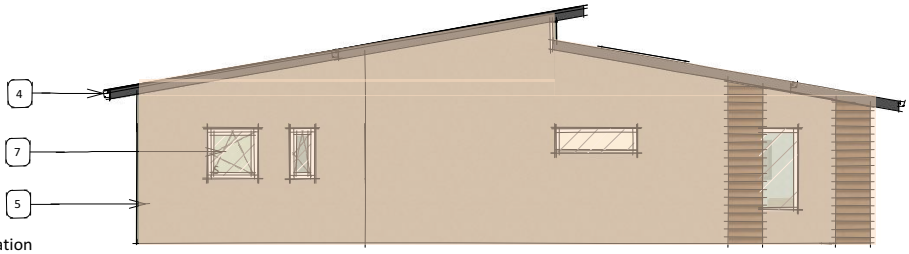


1 Elevation
Scale: 1:100

2 Elevation
Scale: 1:100



3 Elevation
Scale: 1:100



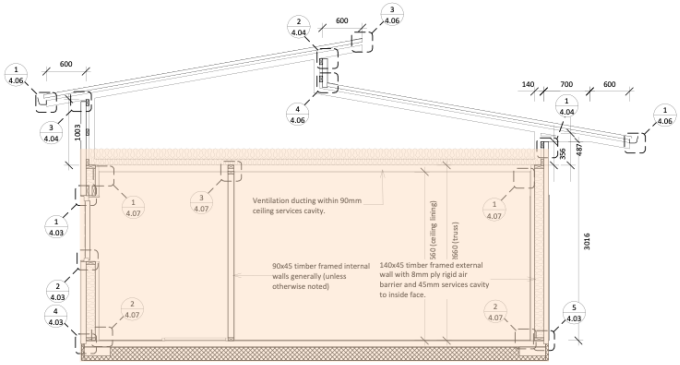
4 Elevation
Scale: 1:100

5. Internal pictures

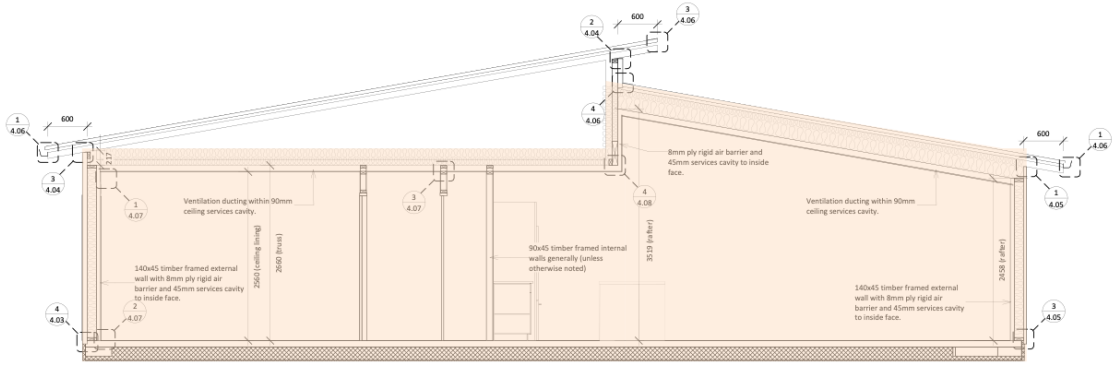
6. Cross sections

Thermal envelope

CONSTRUCTION 26/08/15



1 Section
Scale: 1:50



2 Section
Scale: 1:50

Location Information	
Earthquake Zone	Zone 3
Climate Zone	Zone 2
Rainfall Intensity	70 - 80 (range)
Wind Area	A
Lee Zone	No
Wind Zone	High
Durability Zone (NZS3604 4.2.2)	Zone C

All metal components are to meet the requirements of NZS3604 tables 4.1, 4.2 & 4.3 for the specified durability zone type)

The builder is responsible for the setting out of the works, the checking of all dimensions and levels on site, and the reporting of any discrepancies to the proprietor prior to commencement of work.
Do not scale from drawings.
All work is to comply with the acceptable solutions of the NZ Building Code and NZS 3604: 2011.

Where plans are used for construction without a direct contract for construction supervision by the designer then the designer shall not accept responsibility for any issue which may arrise during or after the construction of this project due to deviation from these documents.

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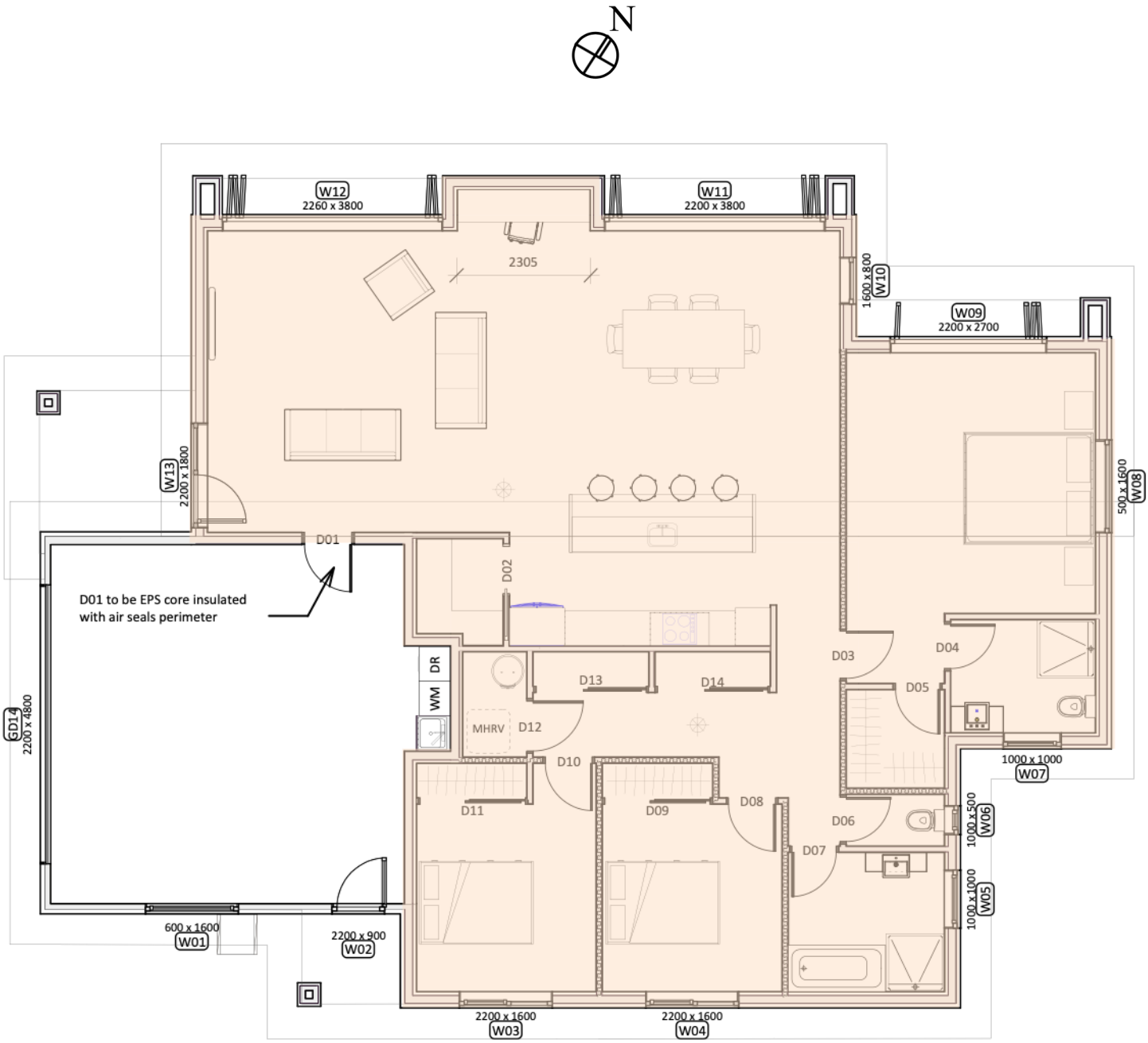
eHaus design for sustainable living

REV ISSUE:	REV DATE:	REVISION:	
PROJECT	KAPITI SHOWHOME	DRAWN ??	PROJECT # 232EH
CLIENT	THE BUILDING COMPANY LTD	CHKD ??	DWG # 3.01
ADDRESS	7 WAIPUNAHAU RD, WAIKANAE	SCALE @ A3 1:100	
DWG	SECTIONS		REVISION

7. Floor Plans

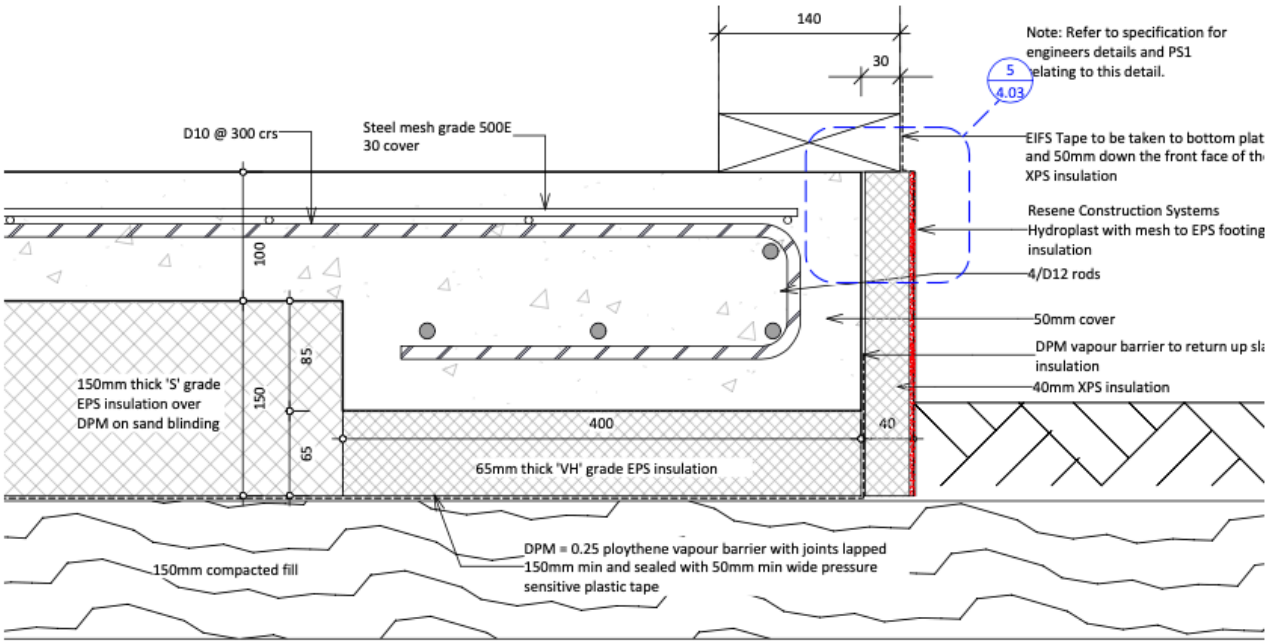
Ground floor with Treated Floor Area marked



8. Construction details

8.1 Footing and Slab

The U-value of the floor slab achieved is 0.184W/(m²K) by using expanded polystyrene insulation. The concrete floor slab is floating on top of the structural insulation and links to the 140mm timber frame used for the walls.



Assembly no.						Interior insulation?
04ud	Floor Pad					

Heat transmission resistance [m²K/W]

Orientation of building element: 3-Floor
Adjacent to: 2-Ground

interior R_{si}: 0.13
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]
DPC	1.000					1
EPS Bondor	0.038					200
Reinforced concrete	2.400					100

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			30.1 cm

U-value supplement: W/(m²K)

U-value: 0.184 W/(m²K)

Footing and Slab

8.2 Exterior Walls

For the exterior walls are a 140mm framework with insulation in between (140mm R4.0) and then a taped and 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 0.220 W/(m²K). There is then an air cavity and a plaster coated polystyrene panel but this is disregarded in the calculations as it has a vented cavity.

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

Heat transmission resistance [m²K/W]

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

Adjacent to: 3-Ventilated — 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	0.045	Compressed & metal	0.080			45
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
91%	9.0%		20.3 cm

U-value supplement: W/(m²K)

U-value: 0.220 W/(m²K)

Wall structure

8.3 Insulation of the Roof

There are two roof details that cover the flat and cathedral ceiling in this home. The U value of the flat roof is 0.126 W/(m²K) and achieved using two layers of overlapping fibreglass insulation. The U value of the cathedral roof is 0.159 W/(m²K) and also achieved using two layers of overlapping fibreglass insulation.

Assembly no.						Interior insulation?
06ud	Cathedral Ceiling					

Heat transmission resistance [m²K/W]

Orientation of building element: 1-Roof — interior R_{si}: 0.13

Adjacent to: 3-Ventilated — 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
Fibreglass Insulation - Pink Batts Ultra R1.8	0.050	Compressed Rondo	0.100			90
Air Tight Membrane	0.000					0
Fibreglass Insulation - Pink Batts Ultra R5.0	0.042	Timber	0.130			210
Building Wrap	0.000					0

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
92%	8.4%		31.0 cm

U-value supplement: W/(m²K)

U-value: 0.159 W/(m²K)

Assembly no.			Interior insulation?
07ud	Ceiling Flat		

Heat transmission resistance [m²K/W]

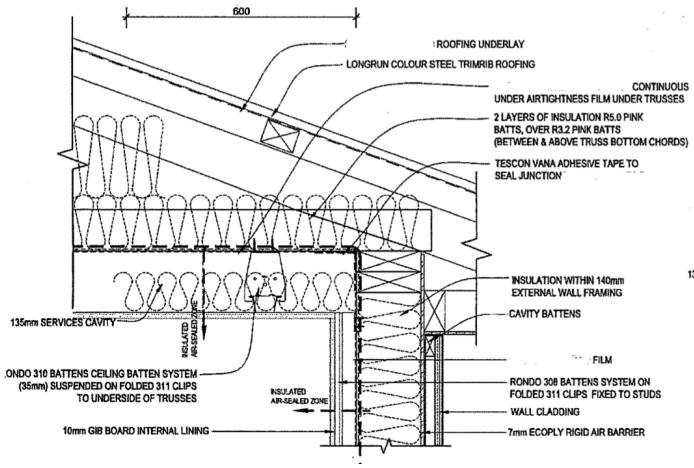
Orientation of building element	1-Roof	interior R_{si}	0.13
Adjacent to	3-Ventilated	exterior R_{se}:	0.13

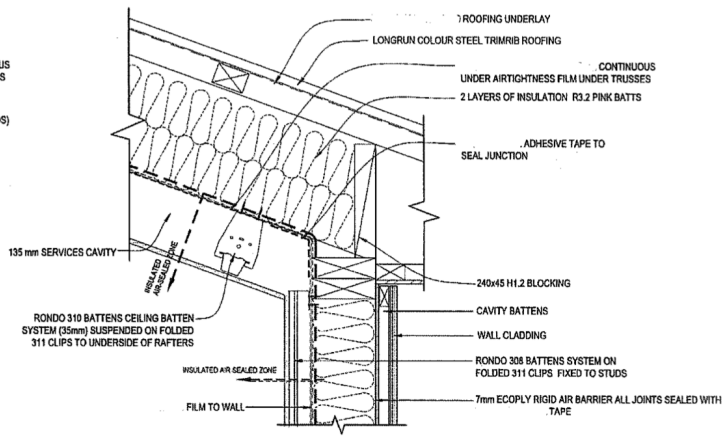
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Plaster Board	0.160					13
Rondo Batten / Pink Batts Ultra R1.8 Ceiling	0.050	Metal battens	0.100			90
Air Tight Membrane	1.000					0
Pink Batts Ultra R5.0 Ceiling	0.042	Joist	0.130			210
Pink Batts Ultra R1.8 Ceiling	0.050	Joist	0.130			90

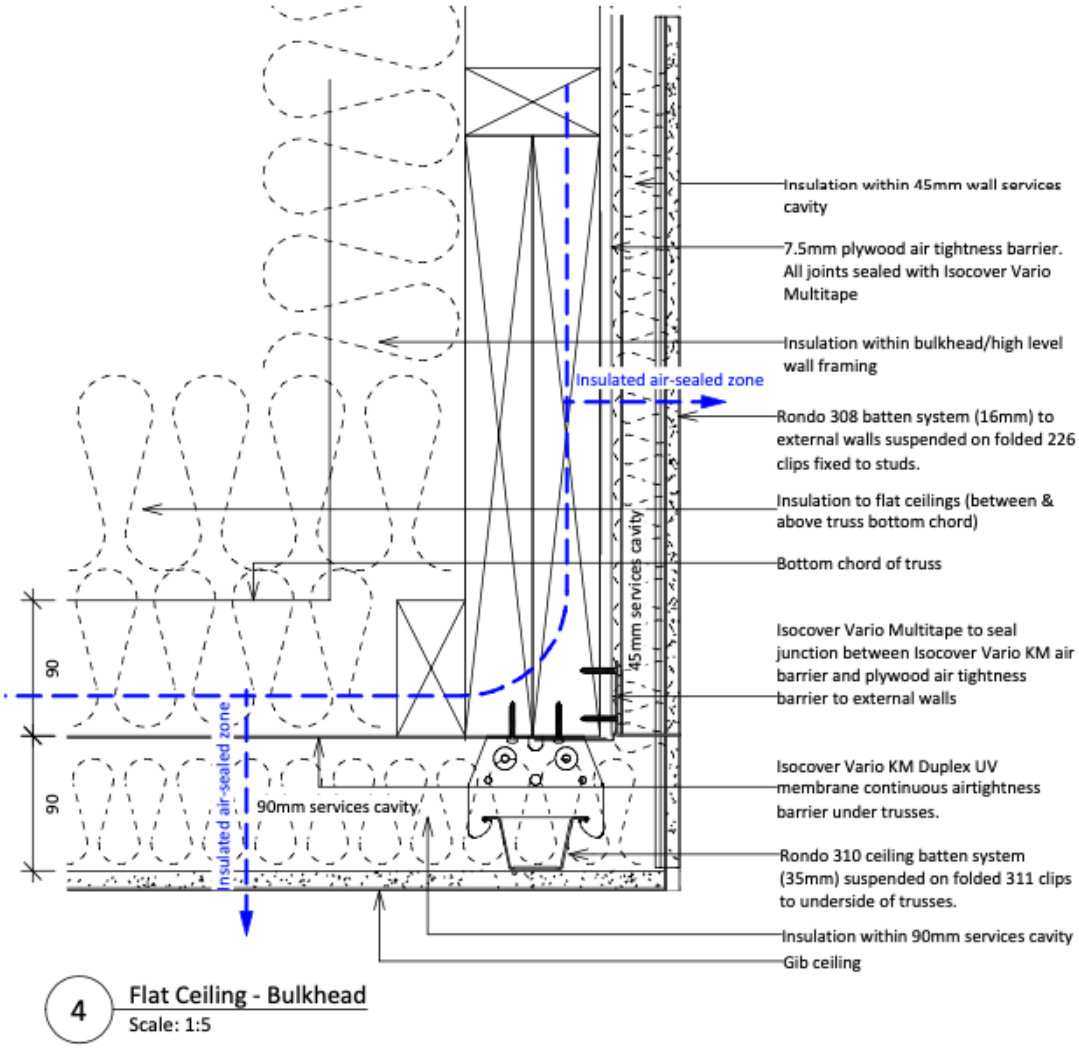
Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
92%	8.0%		40.3 cm

U-value supplement: W/(m²K)

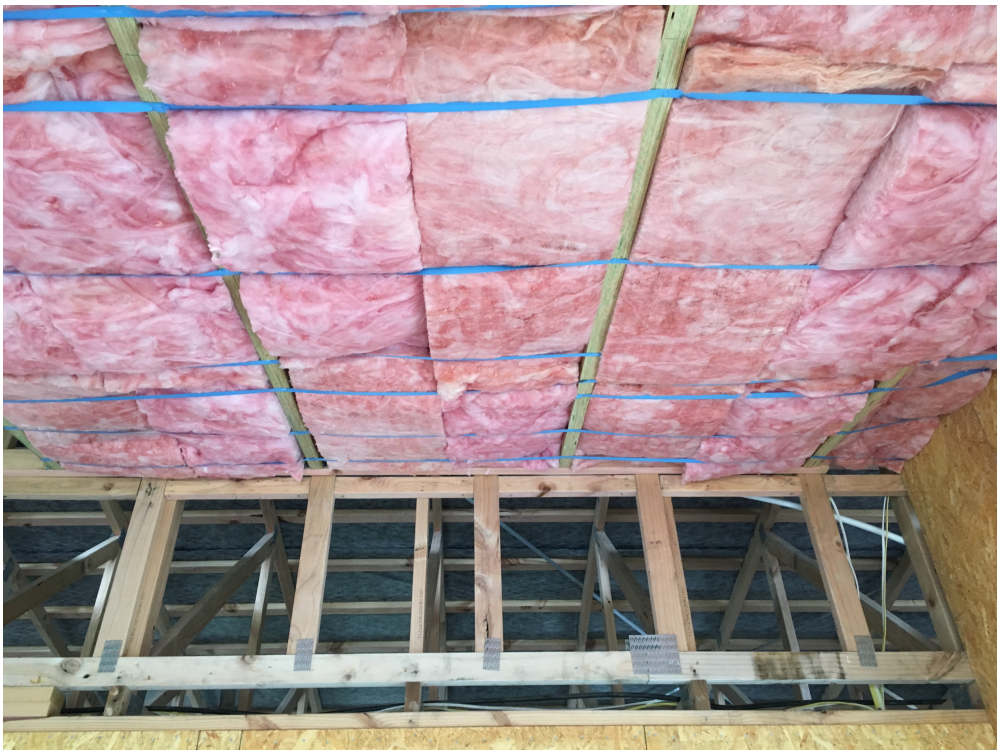
U-value: 0.126 W/(m²K)







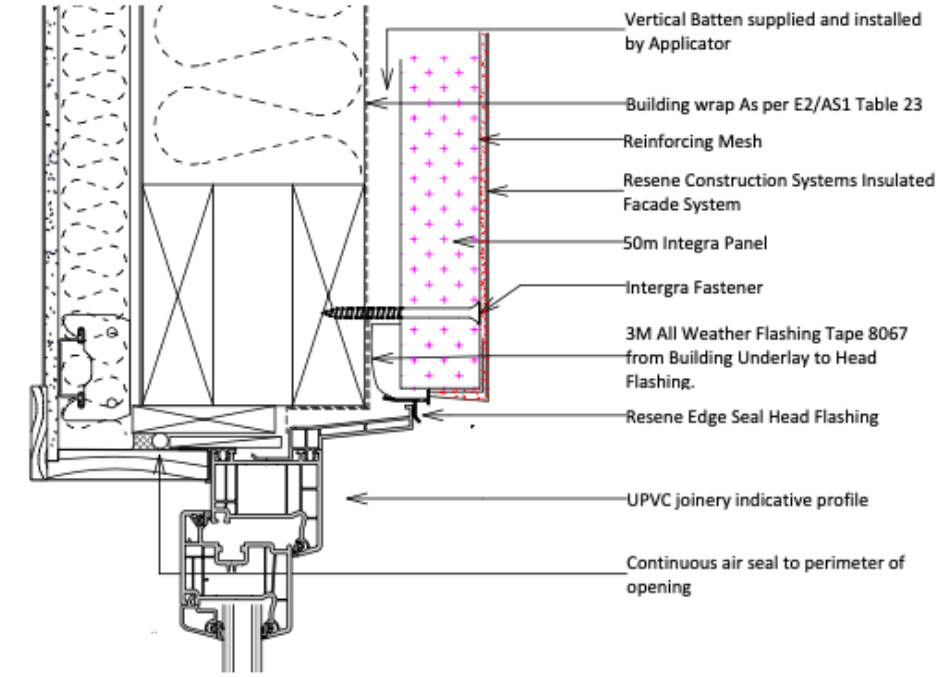
Ceiling insulation



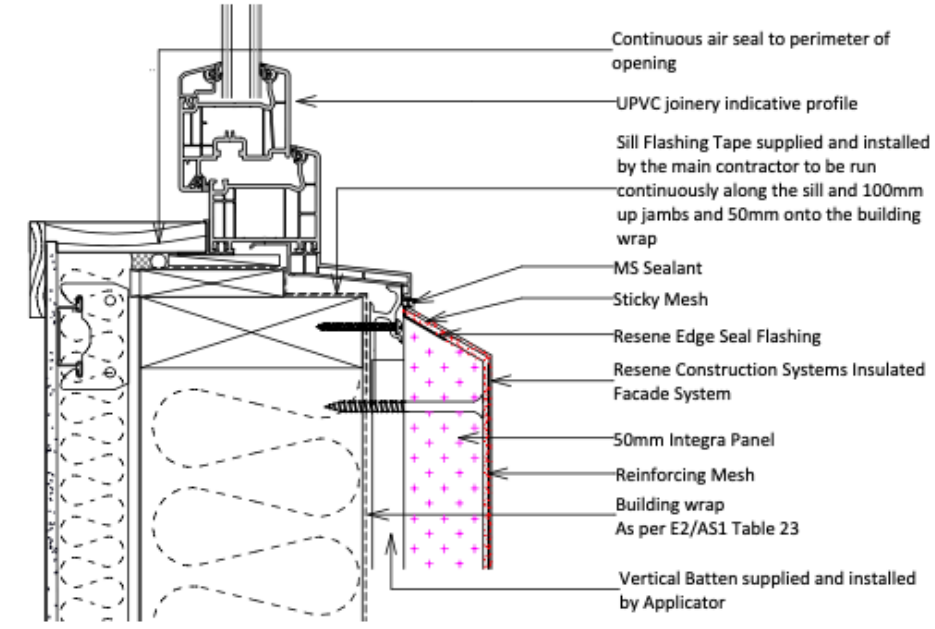
8.4 Window installation details

The window joinery used for this project was softline AD70 uPVC.(Uf-value 1.5 W/(m²K)) These windows were manufactured in New Zealand by Advanced windows located in Bulls.

The glazing was triple 4- 14 - 4 - 14 - 4 Low E Argon Double glazing (Ug-value 1.1 W/(m²K), g-value 62%) These windows were manufactured in New Zealand by Advanced windows in Bulls. The glazing was supplied by Viridian NZ.



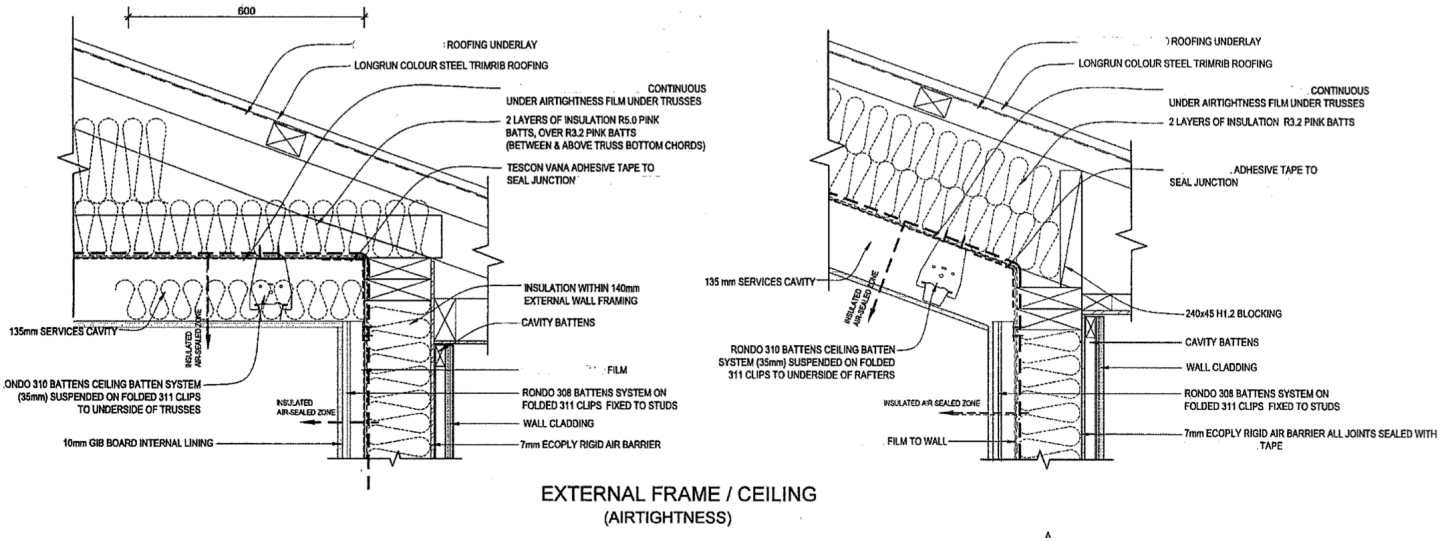
1 Window Head - Integra
Scale: 1:5



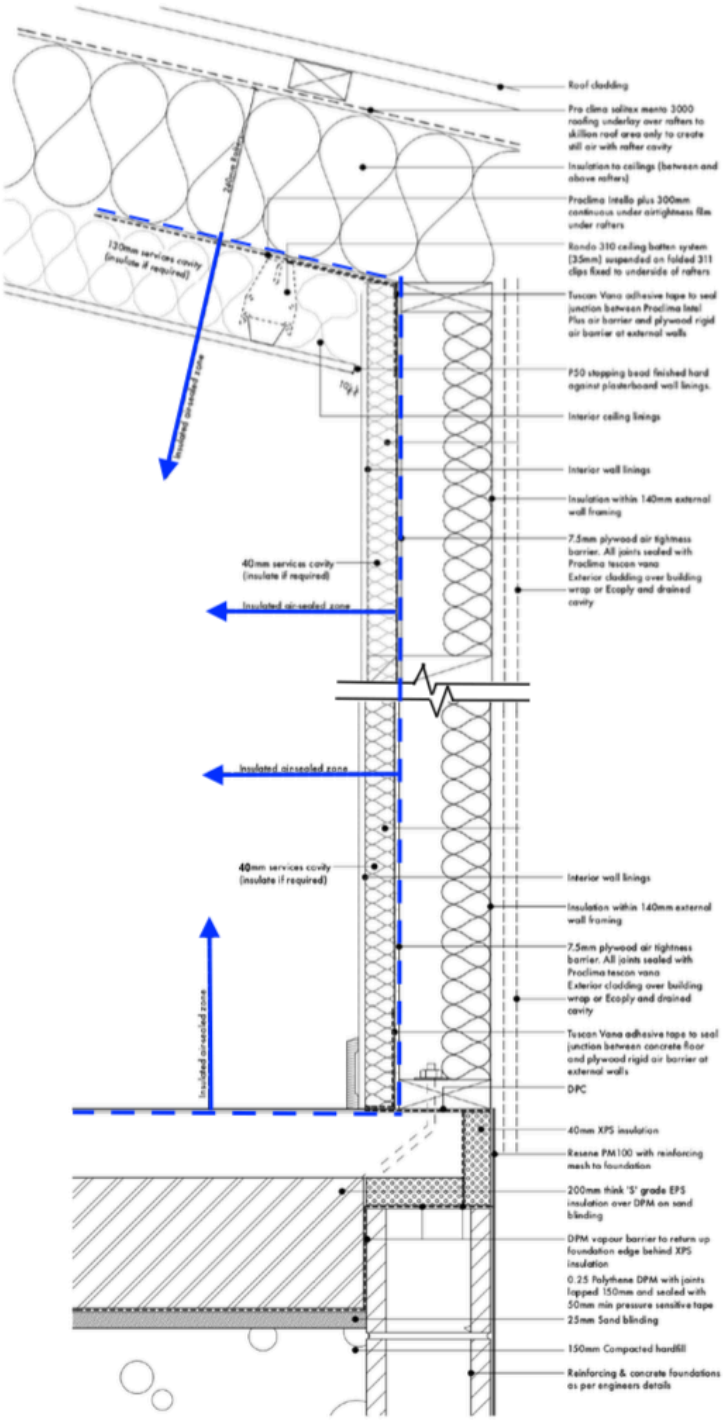
Windows installation

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.



EXTERNAL FRAME / CEILING
(AIRTIGHTNESS)



Airtightness Detail

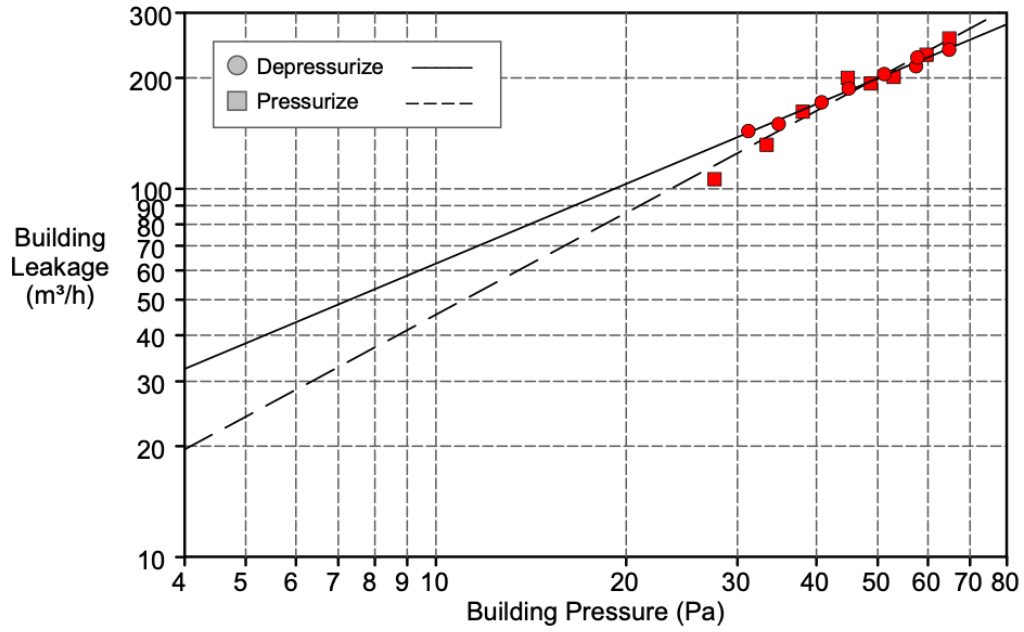
Result of the Airtightness Test

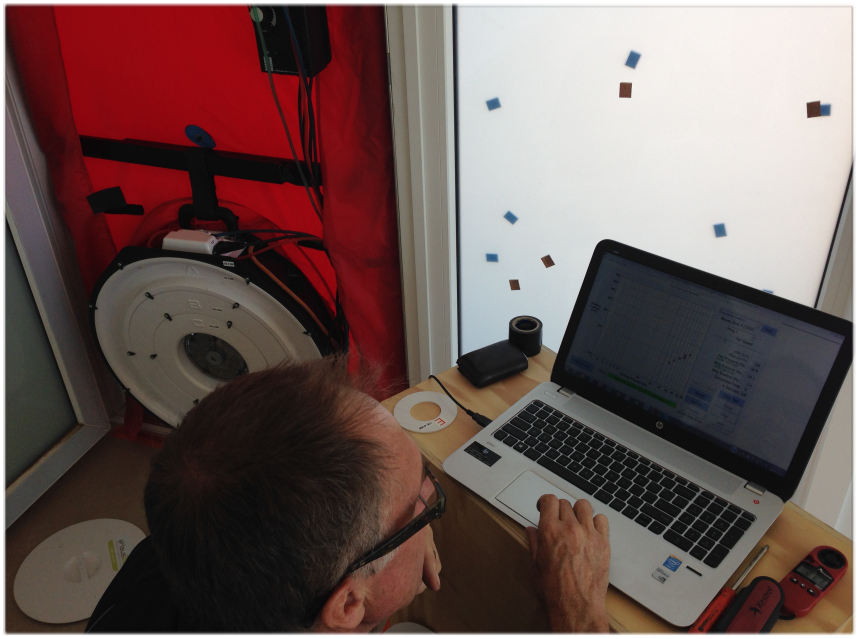
BUILDING LEAKAGE TEST

Date of Test: 30/03/2016		Technician:	Baden Brown
Test File: Completed Showhome Final test30032016		Project Number:	Kapiti Show Home
Customer:	The Building Company 7 Waipunahau Street Waikanae, Kapiti Coast Phone: Fax: Email: jon@ehaus.co.nz Website: www.ehaus.co.nz	Building Address:	eHaus 7 Waipunahau Street Waikanae, Kapiti Coast

	Depressurization	Pressurization	Average
Test Results at 50 Pascals:			
V50: m³/h Airflow	199 (+/- 1.8 %)	200 (+/- 4.9 %)	200
n50: 1/h Air Change Rate	0.48	0.48	0.48
w50: m³/h/m² Floor Area	1.34	1.35	1.35
q50: m³/h/m² Envelope Area	0.38	0.38	0.38
Leakage Areas:			
Canadian EqLA @ 10 Pa (cm²)	70.0 (+/- 13.0 %)	50.8 (+/- 34.4 %)	60.4
cm²/m² Surface Area	0.13	0.10	0.12
LBL ELA @ 4 Pa (cm²)	35.0 (+/- 20.3 %)	21.2 (+/- 53.5 %)	28.1
cm²/m² Surface Area	0.07	0.04	0.05
Building Leakage Curve:			
Air Flow Coefficient (Cenv) (m³/h/Paⁿ)	12.0 (+/- 31.3 %)	5.5 (+/- 82.6 %)	
Air Leakage Coefficient (CL) (m³/h/Paⁿ)	12.0 (+/- 31.3 %)	5.5 (+/- 82.6 %)	
Exponent (n)	0.719 (+/- 0.080)	0.919 (+/- 0.210)	
Correlation Coefficient	0.99388	0.97479	

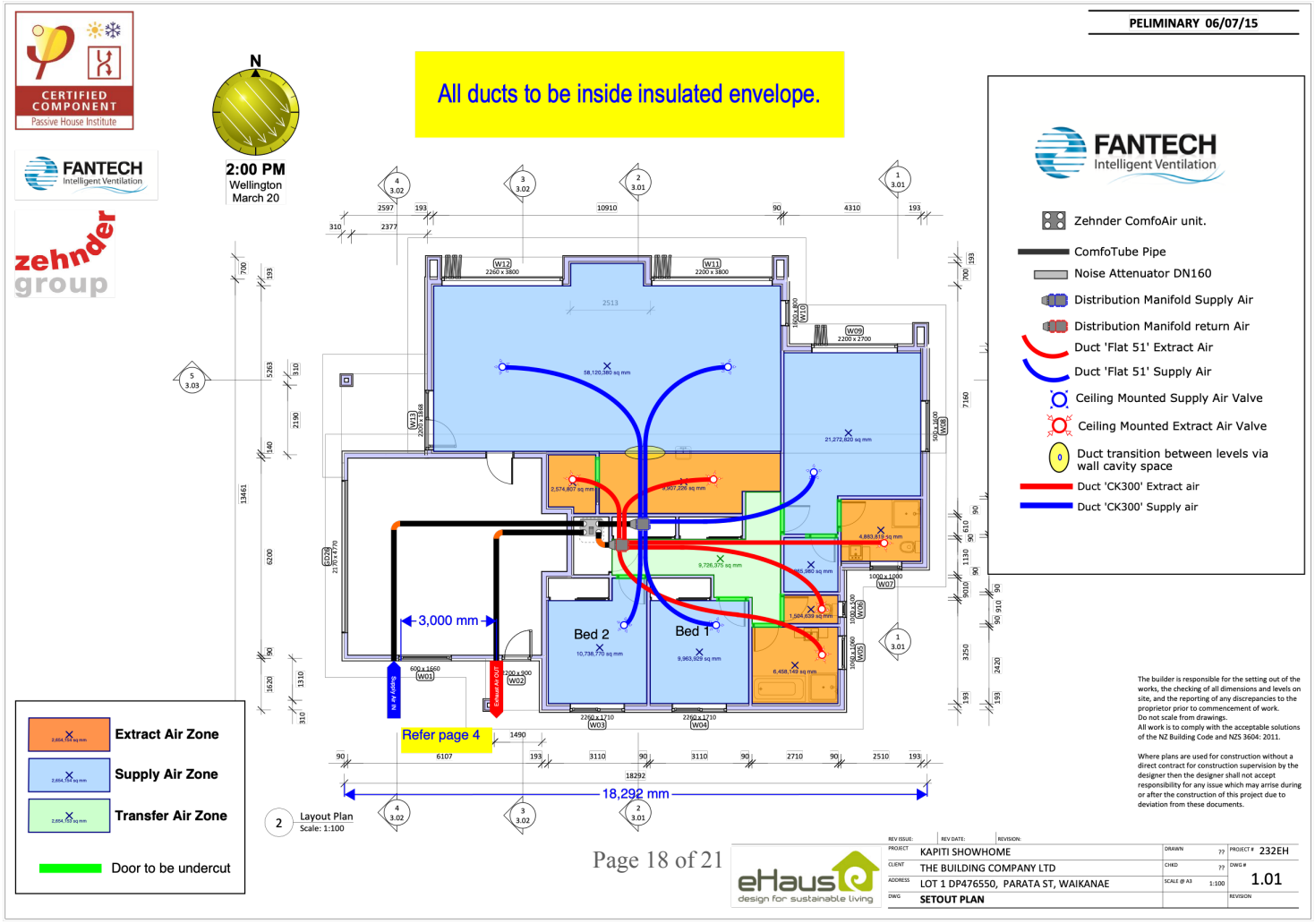
Test Standard:	EN 13829
Test Mode:	Depressurization and Pressurization
Type of Test Method:	A
Regulation complied with:	EN13829 n50 ≤ .6 1/h





10. Ventilation units and system design

The Zehnder comfo air 350 unit with a heat recovery coefficient of 78% and a power consumption at 100Pa of 0.29Wh/m³.The unit is located in the service cupboard along with the hot water storage.

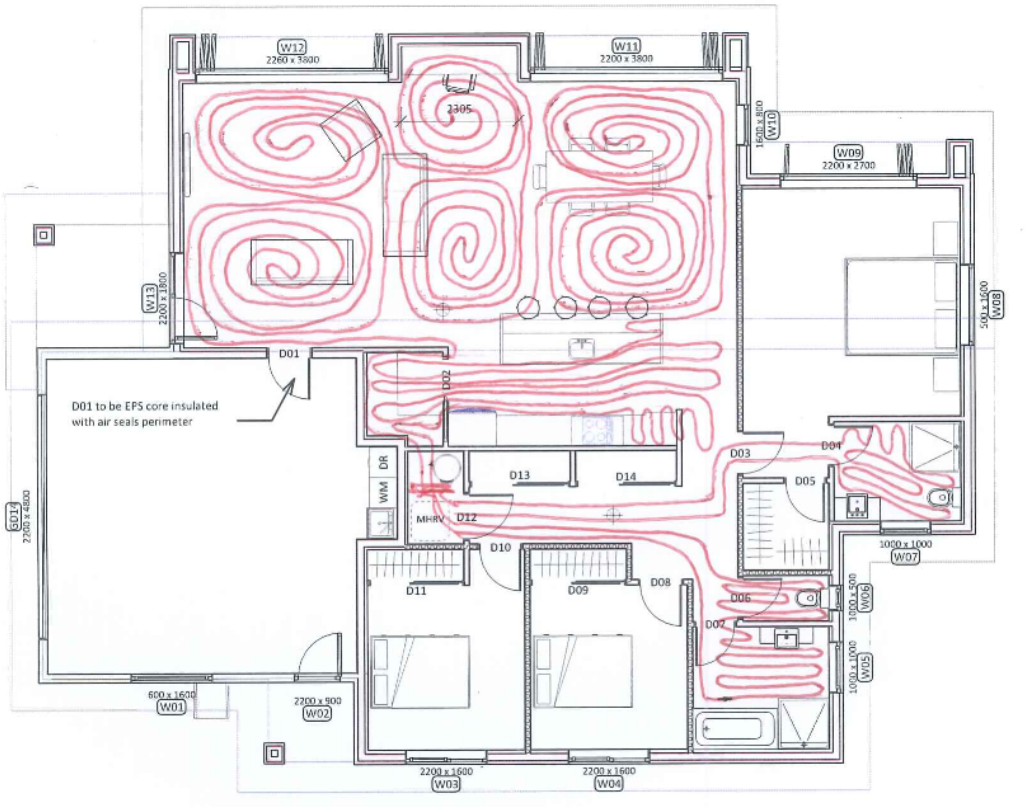


The Zehnder ComfoAir 350 and hot water cylinder in the service cupboard

11. Heat Supply

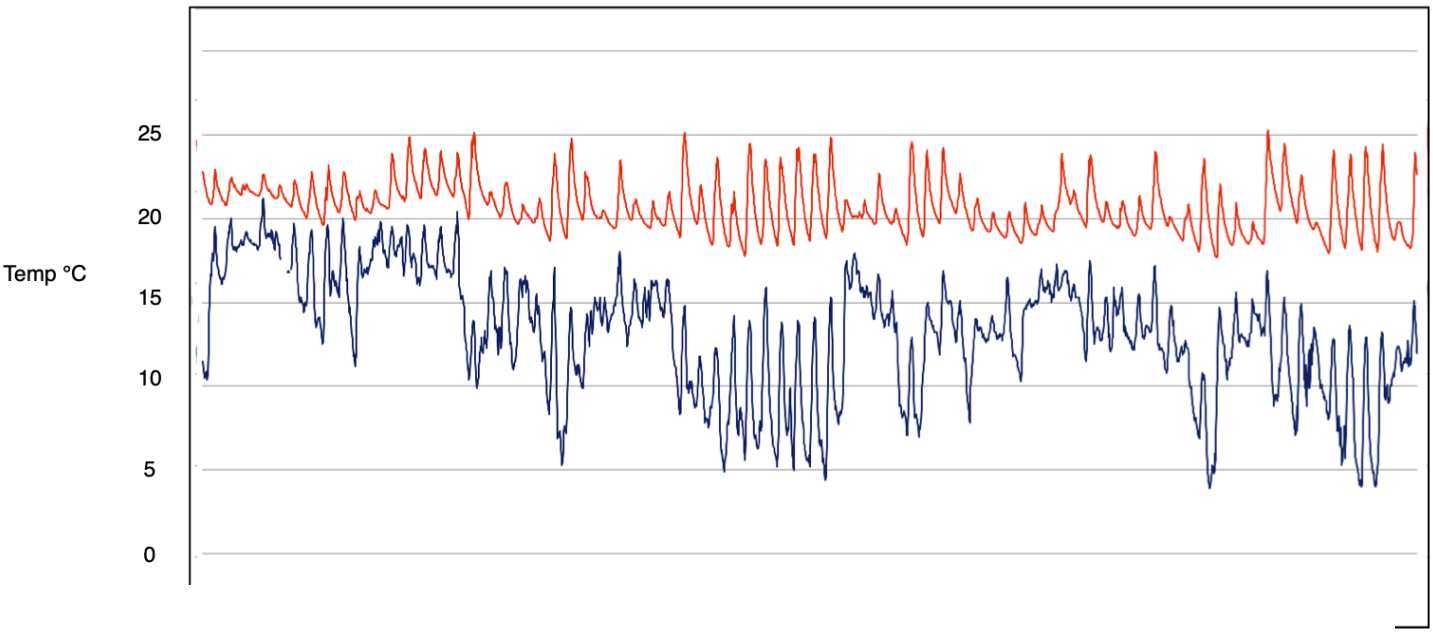
The heating requirement is supplied with tan under floor hydronic system with water supplied by the air to water heat pump split system. This shows the pipe runs that were installed in the living, kitchen, bathroom and hallways.

Hydronic pipe layout



12. PHPP Results

The home has been monitored for temperature and here are the results for May, June and July in 2016



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Passive House Verification

Building:	Kapiti Show Home		
Street:	7 Waipunahau Road		
Postcode/City:	5036	Waikanae	
Province/Country:	Wellington	NZ-New Zealand	
Building type:	Single Family Residence		
Climate data set:	NZ0009a-Paraparaumu		
Climate zone:	4: Warm-temperate	Altitude of location:	24 m
Home owner / Client:	The Building Company LTD		
Street:	P O box 292		
Postcode/City:	5036	Waikanae	
Province/Country:	Wellington	NZ-New Zealand	
Architecture:	eHaus - Ross Bennett		
Street:	400 Victoria Avenue		
Postcode/City:	4500	Whanganui	
Province/Country:	Manawatu - Whanganui	NZ-New Zealand	
Mechanical system:	ecoBuild Developments Ltd		
Street:	400 Victoria Avenue		
Postcode/City:	4500	Whanganui	
Province/Country:	Manawatu - Whanganui	NZ-New Zealand	
Energy consultancy:	eHaus - Jon Iffe		
Street:	400 Victoria Avenue		
Postcode/City:	4500	Whanganui	
Province/Country:	Manawatu - Whanganui	NZ-New Zealand	
Certification:	Sustainable Engineering Ltd, Jason Quinn		
Street:	76N Virginia Rd		
Postcode/City:	4500	Whanganui	
Province/Country:	Manawatu - Whanganui	NZ-New Zealand	

Year of construction:	2015	Interior temperature winter [°C]:	20.0	Interior temp. summer [°C]:	25.0
No. of dwelling units:	1	Internal heat gains (IHG) heating case [W/m²]:	2.4	IHG cooling case [W/m²]:	3.5
No. of occupants:	2.9	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	144.7				
Space heating	Heating demand kWh/(m²a)	14.3	≤	15	-	yes
	Heating load W/m²	13	≤	-	10	
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	≤	20		yes
Airtightness	Pressurization test result n_{50} 1/h	0.5	≤	0.6		yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	107	≤	-		-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	46	≤	60	60	yes
	Generation of renewable energy kWh/(m²a)	20	≥	-	-	

[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:
14192_SENZ_PH_20160914_JEQ	15/09/16	Whanganui

13. Year of Construction and costs

The construction period was over a 8month period with final landscaping completed to a basic level. Since the home has been sold the outdoor area has been enclosed and more planting of natives has happened. The final cost of the build was $576,000 which worked out to a square metre rate of $2,900

14. Owners experiences

Many people had the opportunity to experience the comfort as the home was open to the public. We even had a live broadcast to the national breakfast TV show which was fun to be involved in this. The people that brought the house had no idea that it was going to provide such a warm and heathy loving environment and have been very pleased with their purchase.

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/kapiti-show-home/