Project Documentation
Gebäude-Dokumentation

Abstract | Zusammenfassung

Browne Residence

Data of building | Gebäudedaten			
Year of construction Baujahr	2018	**Space heating Heizwärmebedarf**	**15 kWh/(m²a)**
U-value external wall U-Wert Außenwand	0.304 W/(m²K)		
U-value floor slab U-Wert Bodenplatte	0.232 W/(m²K)	Primary Energy Renewable (PER) Erneuerbare Primärenergie (PER)	42 kWh/(m²a)
U-value roof U-Wert Dach	0.15 W/(m²K)	Generation of renewable Energy Erzeugung erneuerb. Energie	6 kWh/(m²a)
U-value window U-Wert Fenster	1.34 W/(m²K)	Non-renewable Primary Energy (PE) Nicht erneuerbare Primärenergie (PE)	87 kWh/(m²a)
Heat recovery Wärmerückgewinnung	86 %	Pressurization test n_{50} Drucktest n_{50}	0.34 h^{-1}
Special features Besonderheiten	none		

Brief Description

Browne Residence

The Cambridge Passive House project commenced on site in May 2017 and was completed in February 2018 and achieved certification in June 2018.

The home was designed for a couple who wanted a home which would work for them in their retirement. The upper level of the home is designed as guest accommodation while the lower level of the home is for day to day living for the owners. The house is located on a small corner triangular site in central Cambridge. The street frontage is to the south with the outdoor living area to the north.

The house is constructed of a mixture of light timber framed structure and structural insulated panels. The concrete floor slab is fully insulated using EPS. The windows are double glazed European timber windows. Solar hot water heating is used for domestic hot water with any excess hot water diverted to the outside swimming pool.

Kurzbeschreibung

Browne Residenz

Das Cambridge-Passivhaus-Projekt startete im Mai 2017 vor Ort und wurde im Februar 2018 abgeschlossen und im Juni 2018 zertifiziert.

Das Haus war für ein Ehepaar konzipiert, das ein Zuhause wünschte, das für sie im Ruhestand arbeiten würde. Die obere Ebene des Hauses ist als Gästeunterkunft konzipiert, während die untere Ebene des Hauses für die Eigentümer zum täglichen Leben bestimmt ist. Das Haus befindet sich in einer kleinen dreieckigen Ecke im Zentrum von Cambridge. Die Straßenfront liegt im Süden, der Wohnbereich im Freien im Norden.

Das Haus besteht aus einer Mischung aus leichten Fachwerkkonstruktionen und strukturellen Isolierplatten. Die Betondecke ist vollständig mit EPS gedämmt. Die Fenster sind doppelt verglaste europäische Holzfenster. Solare Warmwasserbereitung wird für Brauchwarmwasser verwendet, wobei überschüssiges Warmwasser in den Außenpool geleitet wird.

Responsible project participants
Verantwortliche Projektbeteiligte

Architect Entwurfsverfasser	Tim Ross, Architype Ltd
Implementation planning Ausführungsplanung	Tim Ross, Architype Ltd
Building systems Haustechnik	Fantech NZ Ltd
Structural engineering Baustatik	Upright Engineering Ltd
Building physics Bauphysik	Tim Ross, Architype Ltd
Passive House project planning Passivhaus-Projektierung	Tim Ross, Architype Ltd
Builder Bauleitung	Brown Construction (Ehaus Waikato)

Certifying body
Zertifizierungsstelle

Sustainable Engineering Ltd
www.sustainableengineering.co.nz

Certification ID
Zertifizierungs ID

5661	Project-ID (www.passivehouse-database.org) Projekt-ID (www.passivhausprojekte.de)

Author of project documentation
Verfasser der Gebäude-Dokumentation

Tim Ross, Architype Ltd

Date Datum	Signature Unterschrift
22 January 2020	

1. Exterior photos - Ansichtsfotos

North Elevation

East Elevation


South West View of House

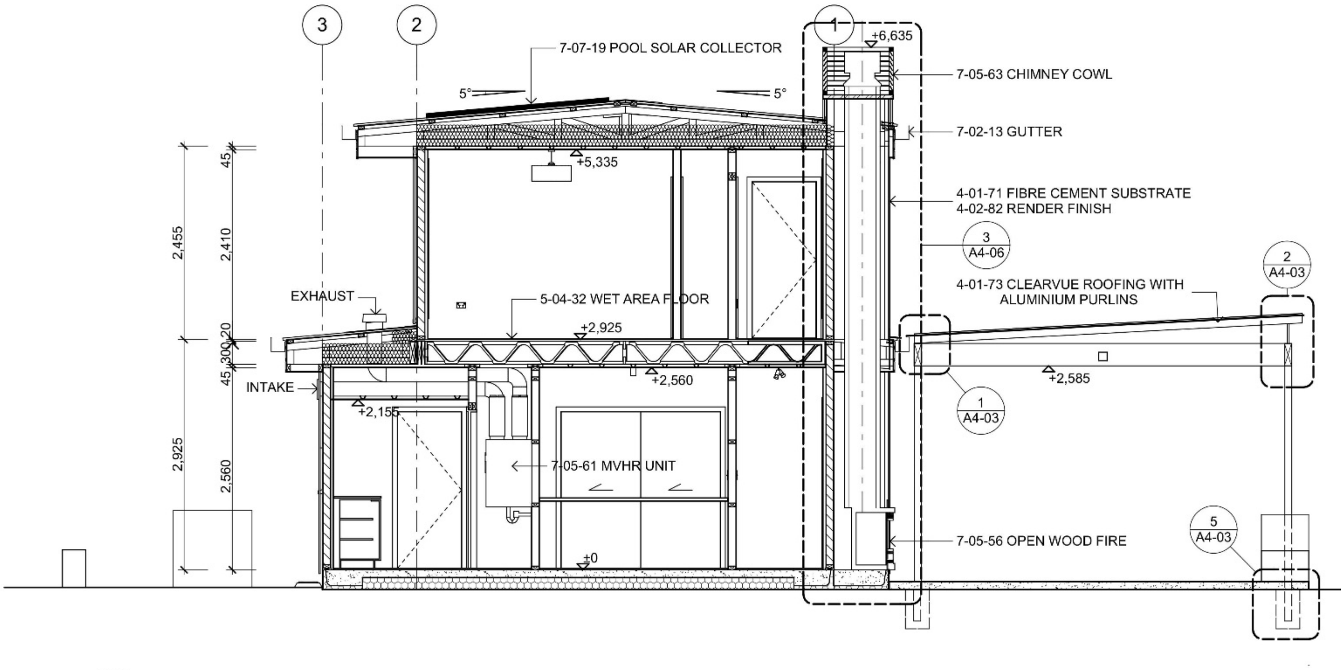
Living Area

2. Interior photos - Innenfoto exemplarisch

Main Bedroom

Formal Living

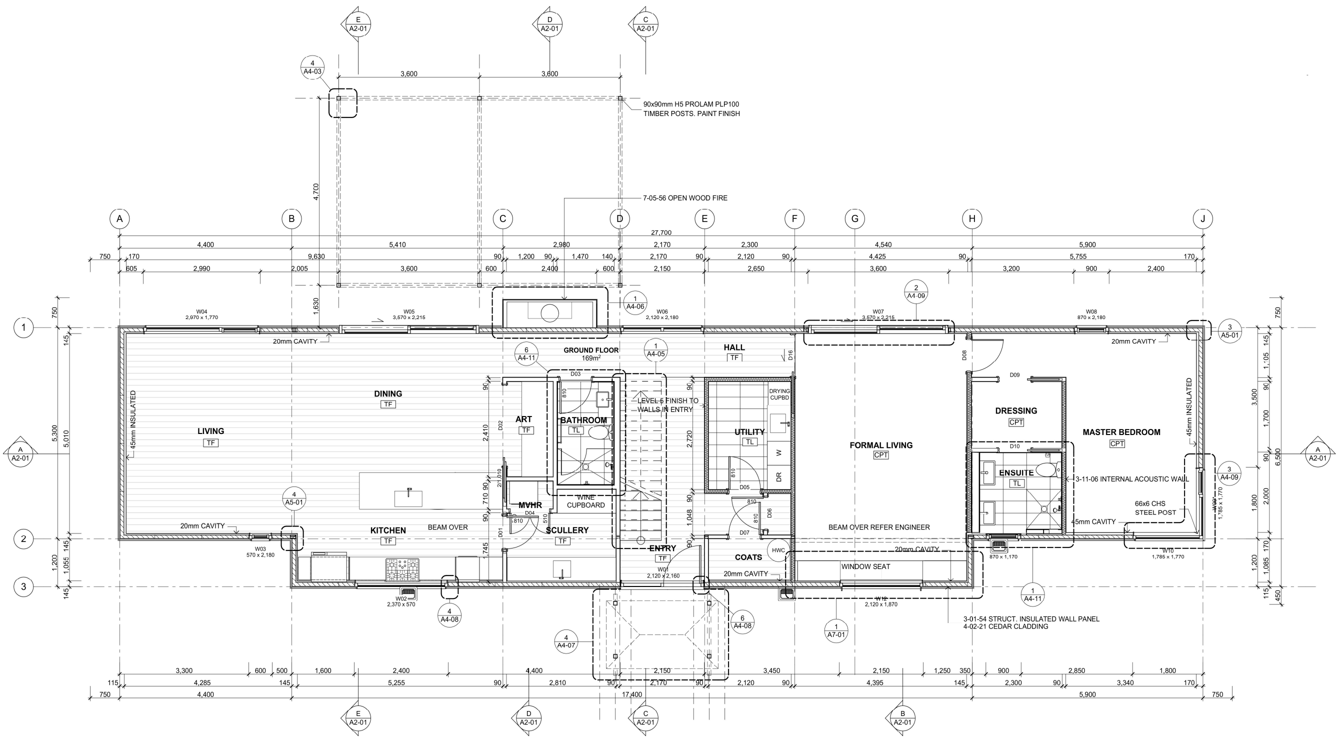
3. Sections - Schnittzeichnung



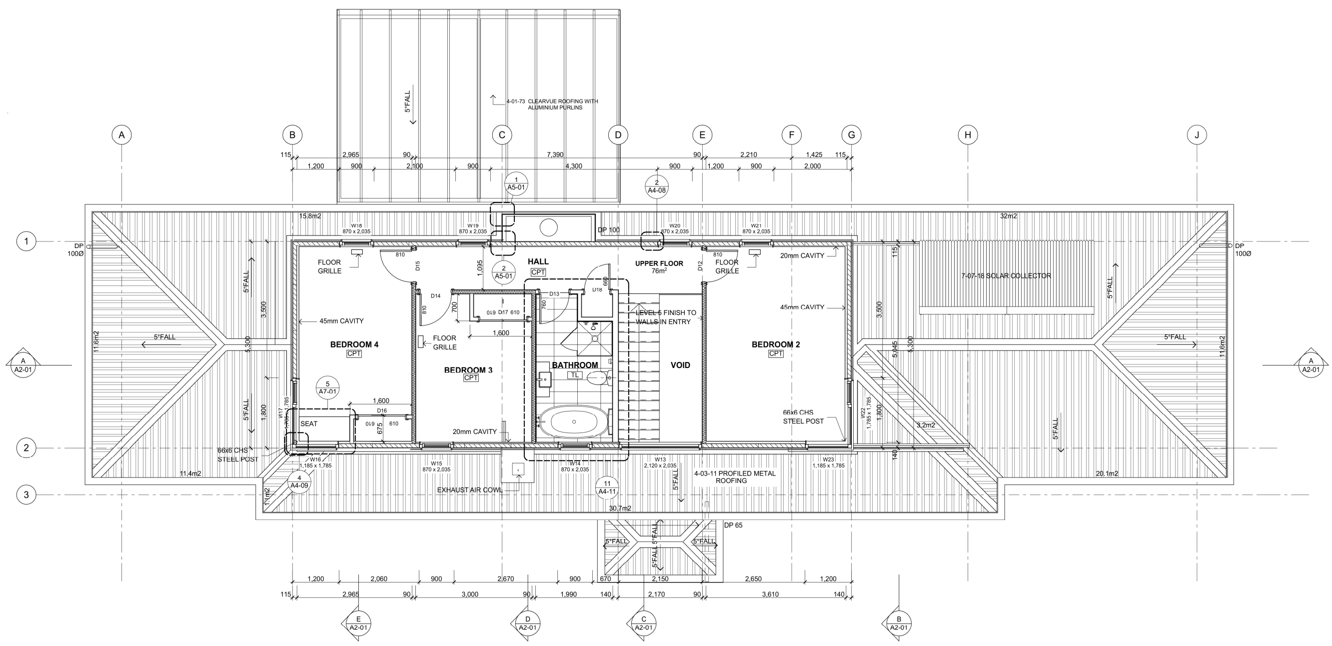
3
A1-02
Section D-D
Scale 1:50

The floor slab sits on 150mm of expanded polystyrene insulation which returns up the side of the foundation fully insulating the slab. The walls are constructed of structural insulated panels. The mid floor is composed of open web floor joists which provide easy distribution of the ventilation ducting. The roof is constructed using low pitched roof trusses. The clients wanted a wood burning fire. Because the fire was unnecessary from a heating perspective, and in order to simplify the design, the fire was located outside the thermal envelope facing the outdoor patio area. A timber framed shade structure is located to the northern (sunny) side of the house to provide both shading to the large north facing doors but also shelter to the outdoor living area.

4. Floor plans - Grundrisse



1 Ground Floor Plan
Scale 1:50



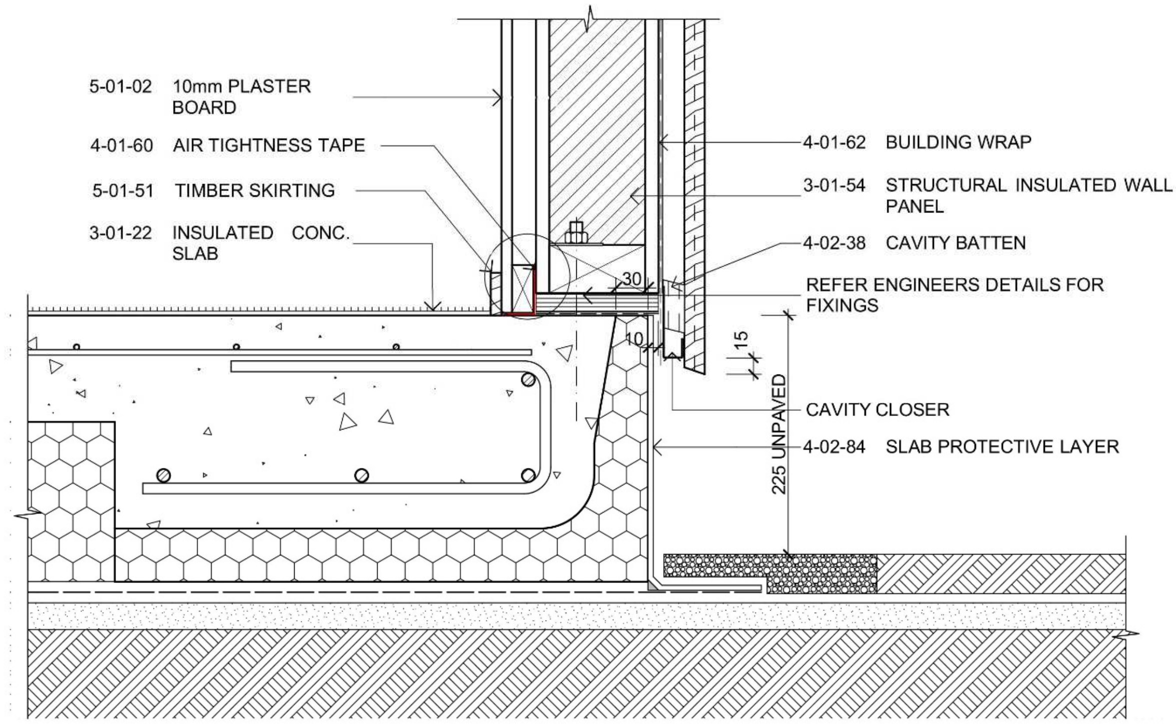
2 Upper Floor Plan
Scale 1:50

5. Floor slab/ basement ceiling construction including insulation Konstruktion der Bodenplatte

The reinforced concrete floor slab is 100mm thick and sits on 150mm of expanded polystyrene insulation. Around the edges of the slab the foundation is thickened to 200mm to support load beading walls above. In these areas the insulation is only 50mm thick under the slab and tapers to 30mm min as it returns up the side of the foundation. This provides a fully insulating the slab and also keeps the thermal mass on the inside of the envelop which is beneficial for the PHPP calcs. The expanded polystyrene is protected from water and UV light on the with a plaster render which is applied to the outside face of the insulation. This render is a modified acrylic render and dresses down onto the damp proof membrane which is laid under the whole slab. It is good practice to pour a concrete mowing strip around the edge of the slab where it abuts grass as the plaster system can be damaged by line trimmers. A strip of rot resistant 18mm construction ply is placed on top of the slab. This can be planed if required to accommodate variation in the height of the edge of the slab. The bottom plate of the structural insulated panels are bolted through the plywood and into the slab @ 900 crs using M12 concrete bolts. These bolts must be installed a minimum of 50mm from the edge of the slab to prevent the concrete from breaking out at the edges as the bolts are tightened. The SIPs are then fitted over the bottom plates. These are rebated 45mm along the bottom edge and are placed over the top of the 45 x 90mm bottom plate and glue and nail fixed to the bottom plates to provide a structural connection.

Edge Foundation Detail. This photo is of a similar project except that in this phot the edge insulation is only 15mm thick rather than 30mm thick as it was in this project.

Floor slab prior to pouring concrete

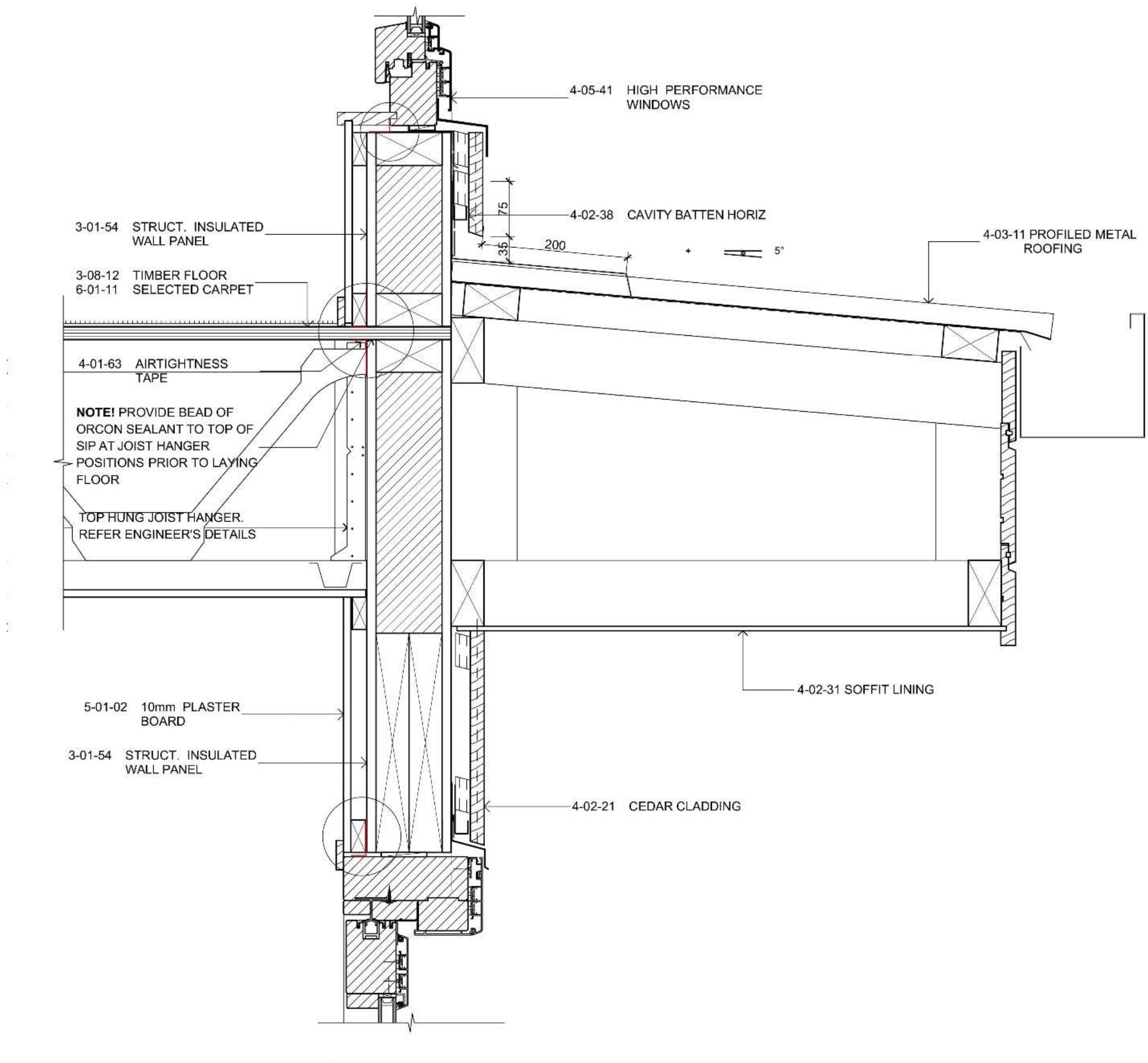


Typical Wall/Floor Detail
Scale 1:5

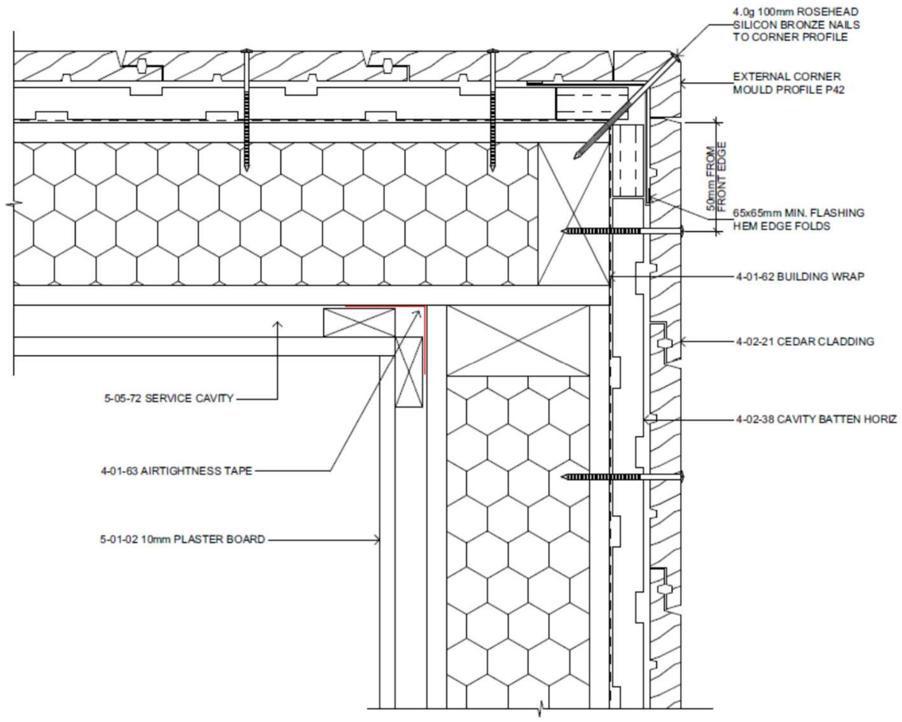
6. Wall construction including insulation - Konstruktion der Außenwände

The exterior walls, as discussed above, where constructed using structural insulated panels or SIPs. These SIPs were supplied by NZSIPs and were composed of a 90mm polyurethane foam core with a thermal conductivity of 0.025[W/(mK)] and two sheets of 12.5mm Oriented Strand Board (OSB) faces on the inside and outside. At the midfloor junction the floor joists were connected to the inside face of the wall panels using steel joist hangers. The flooring, which was also OSB, was glued and taped to the top of the lower wall panels. The bottom plat of the upper SIPs were glued to the flooring and the upper panels were glued and nailed to the top of the bottom plate. The upper insulated panels were then taped to the OSB flooring using Tescon Vana airtightness tape to provide and airtight junction. The midfloor roof eaves were screwed to the outside of the SIPs thus avoiding the need for cantilevers through the thermal envelope. Wherever possible lintels were designed as box beams without any timber lintels though in some cases solid timber lintels were required for larger spans.

The structural insulated panels were joined at the corners with large Spax screws and made airtight with Tescon Vana tape used on the inside join.



5 A2-01 **Mid Floor Cantilever Detail**
Scale 1:5

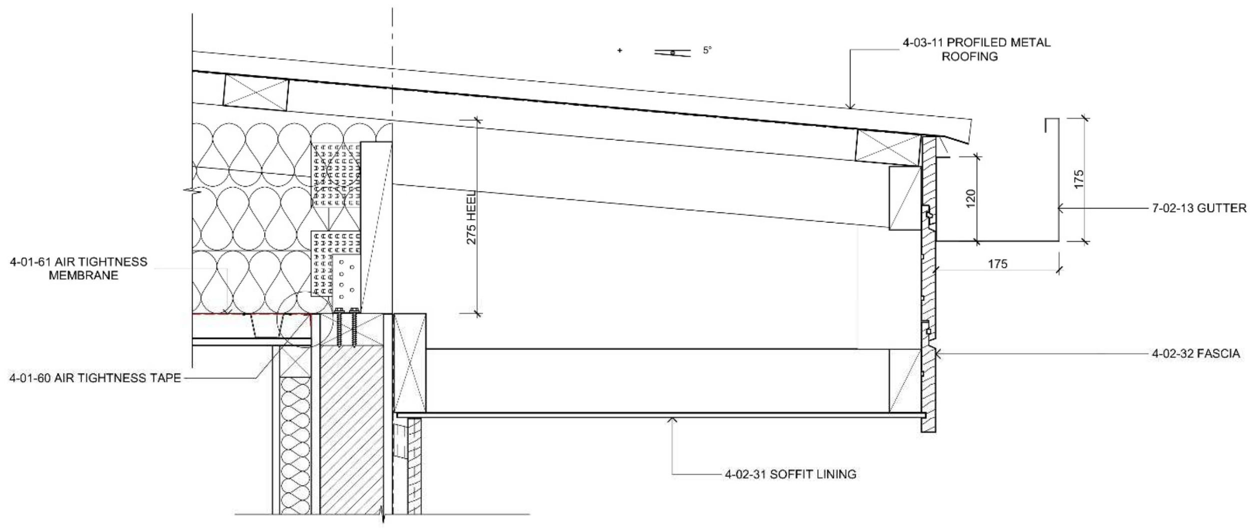


Typical External Wall Detail.

Erecting structural insulated panels

7. Roof construction including insulation - Konstruktion des Daches

The roof was constructed using commonly available timber trusses. The only modification required to make these suitable for passive house projects was to request a higher than normal heel height. In this case the heel needed to be 275mm high to accommodate the greater than normal levels of insulation. The SIPs panels are rebated at the top to fit a 45x90mm continuous timber plate. This timber plate is fitted into the rebate and glued and nailed to support the top edge of the panels. The timber roof trusses are then fixed to this top plate, in this case using proprietary metal brackets. These were screwed into the top plate and into the roof trusses. The roof was made airtight using Proclima Intello airtightness membrane fixed to the underside of the timber trusses. Timber ceiling battens were then used to hold the Intello in place and to support the weight of the fibreglass batts insulation. Batts insulation was also carefully fitted between the webs of the trusses to ensure no gaps occurred in the insulation. The roof itself was a 3 degree profiled metal roof on Thermakraft Covertek roofing underlay on timber purlins on trusses.



1 A2-01 **Typical Upper Eaves Detail**
Scale 1:5

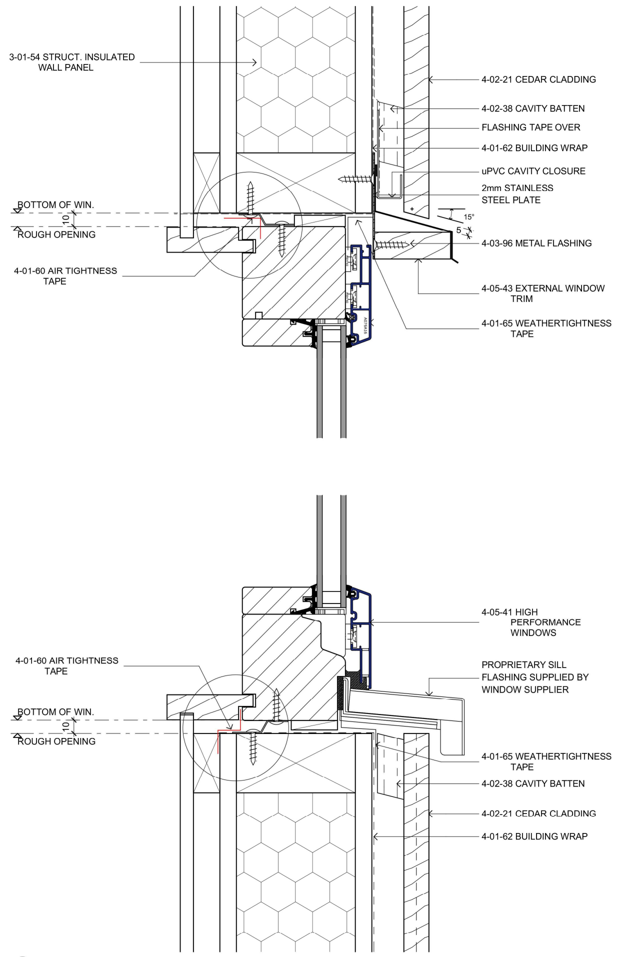
Trusses stacked on top of erected walls prior to installation

Underside of roof showing Intello airtightness membrane

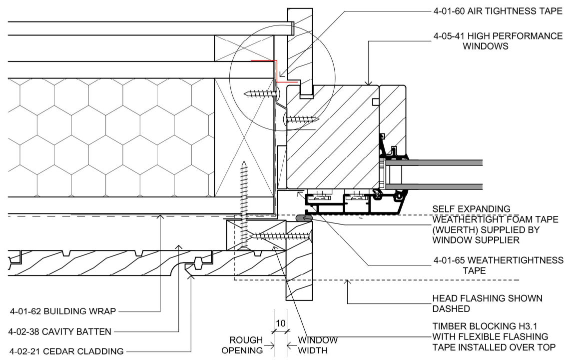
8. Window and window installation including glass Ug / g-value and frame perfromance - Fenster und Fenster-Einbau

The windows specified for this project were Döpfner HA Premium IV68 windows. These windows frames have an aluminium external facing and timber frames internally. The frames were specified as European Spruce with a frame U-Value of 1.32 W/(m²K). The glass was specified as double glazed low-E coated insulated glass units with a U-Value of 1.12 W/(m²K) and a G value of 0.61.

The window frames were fitted flush with the outside face of the wall panels. The cladding material was dressed over the front of the window frames to reduce their apparent thickness from outside. Proprietary metal sills were provided by the window supplier. All windows were taped to the wall panels on the inside face to create an airtight connection between wall and window frame.



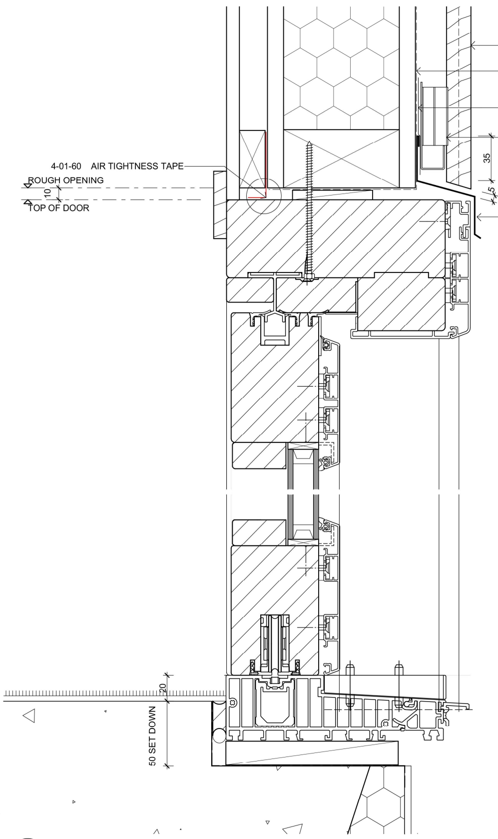
3 Fixed Window Head & Sill Details
A2-01 Scale 1:2



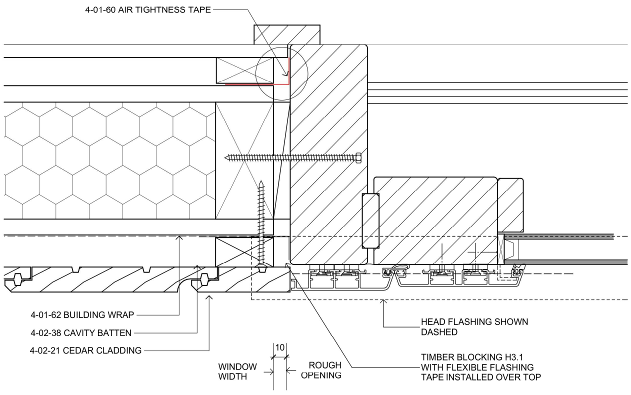
4 Fixed Window Jamb Detail
A2-01 Scale 1:2

Photo of installed window

There were two sets of lift and slide glass doors on this project, one in the living area and the other in the formal living area. Frame U values for these windows varied depending on which framing condition was considered however for the fixed half of the sliding door this was typically around 1.42 W/(m²K). As these sliding door profiles were much thicker than the typical windows the frames were installed with the inside edge flush with the back of the plaster board. These sliding doors were also rebated into the edge of the concrete floor slab to provide a level entry at the thresholds.



1 A2-01 **Sliding Door Sill Detail**
Scale 1:2



2 A2-01 **Sliding Door Jamb Detail**
Scale 1:2

Close up photo of lift and slide sill and jamb.

9. Air leakage testing - Beschreibung der luftdichten Hülle

As discussed above the airtight envelope was created but sealing each part of the thermal envelop to the next. In the case of the floor the airtightness layer is the concrete. This is sealed to the SIPs, which are sealed to the Proclima Intello under the roof trusses. Sealing is usually achieved using Tescon Vana tape. The windows and doors are also a key part of the airtight envelop and these are also taped in place using Tescon Profil tape.

The project doesn't have a dryer at this point but if one is installed in the future it will need to be a condensing or heatpump dryer as it would not be possible to vent to the outside. The rangehood in the kitchen is also a recirculating model and the outlet is in the scullery, not outside the building.

BUILDING LEAKAGE TEST

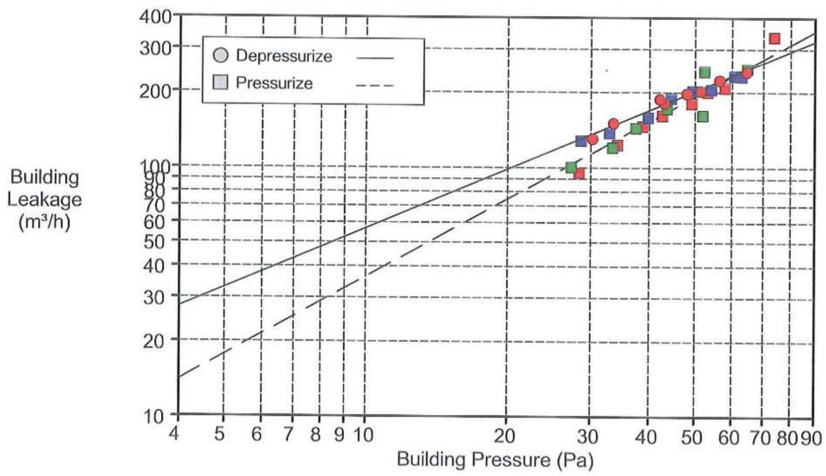
Date of Test: 16/02/2018 Test File: EW03 Final Test 16022018
Technician: Baden Brown
Project Number: EW03

Customer: Denis and Judy Browne
32 Thornton Rd
Cambridge,
Phone:
Fax:
Email: office@brownconstructionltd.co.nz

Building Address: New dwelling
32 Thornton Rd
Cambridge, Waikato

	Depressurization	Pressurization	Average
Test Results at 50 Pascals:			
V50: m³/h50 (Airflow)	203 (+/- 3.3 %)	192 (+/- 4.2 %)	198
n50: 1/h (Air Change Rate)	0.35	0.33	0.34
w50: m³/(h·m² Floor Area)	0.92	0.87	0.89
q50:			
Leakage Areas:			
Canadian EqLA @ 10 Pa (cm²)	63.4 (+/- 19.1 %)	40.6 (+/- 21.7 %)	52.0
LBL ELA @ 4 Pa (cm²)	29.7 (+/- 30.5 %)	15.2 (+/- 34.5 %)	22.5
Building Leakage Curve:			
Air Flow Coefficient (Cenv) m³/(h·Paⁿ)	9.3 (+/- 47.8 %)	3.4 (+/- 54.1 %)	
Air Leakage Coefficient (CL) m³/(h·Paⁿ)	9.2 (+/- 47.8 %)	3.4 (+/- 54.1 %)	
Exponent (n)	0.789 (+/- 0.125)	1.034 (+/- 0.142)	
Correlation Coefficient	0.98758	0.95529	

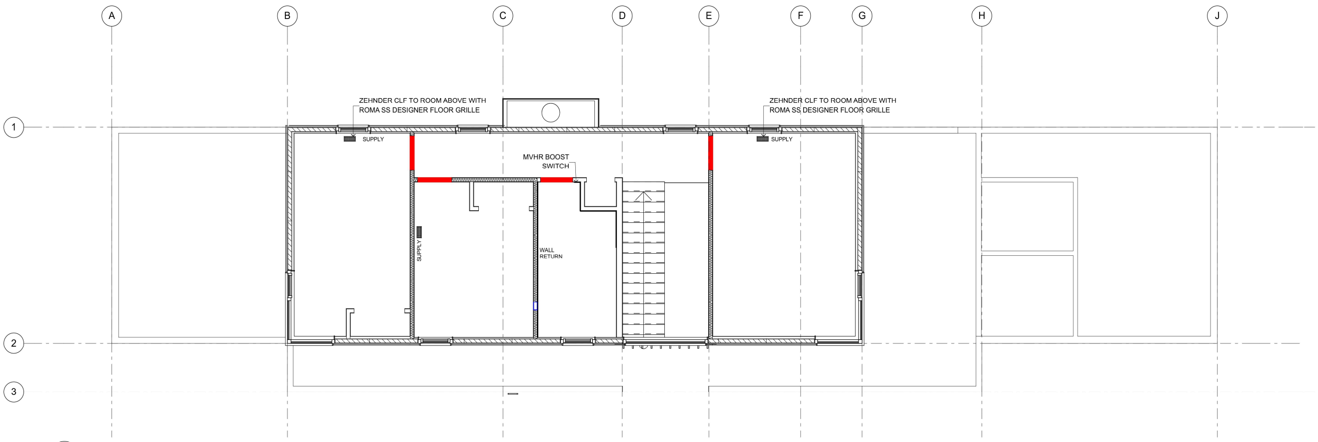
Test Standard: EN 13829
Test Mode: Depressurization and Pressurization
Type of Test Method:
Regulation complied with:



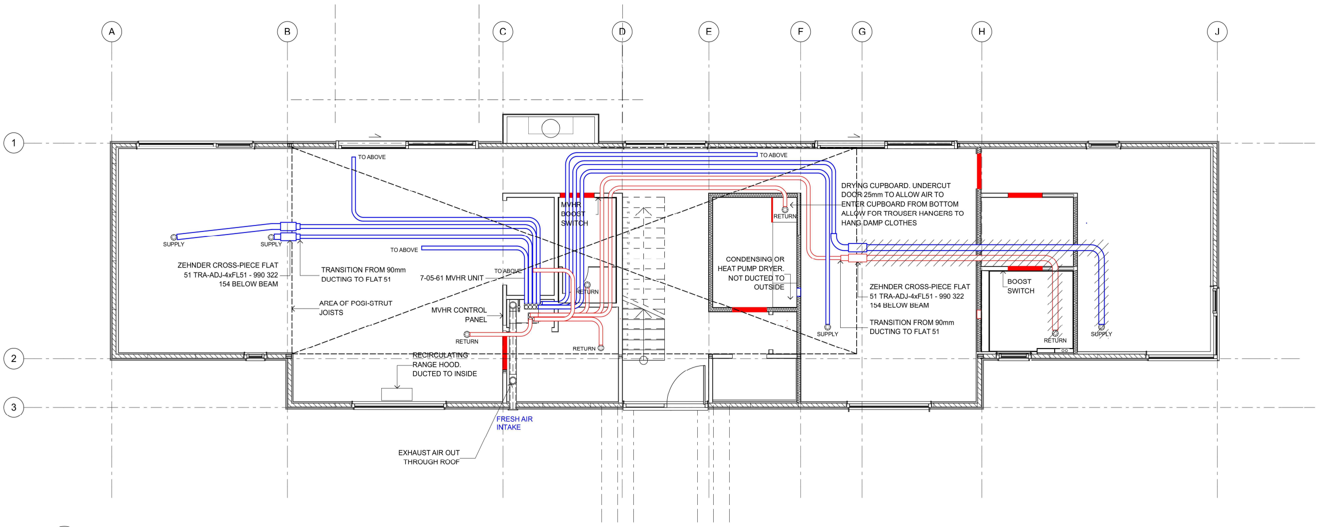
Construction photo showing Proclima Intello airtightness membrane under lower roof section and wall panels taped using Teson Vana airtightness tape.

10. Ventilation ductwork - Lüftungsplanung Kanalnetz

The strategy for the distribution of the ventilation ducting was established very early in the design process and relies heavily on the mid floor zone as the space for running supply and exhaust ducts. The design is a ‘spider’ type system i.e. each of the spaces are supplied by a single dedicated duct which runs back to the central ventilation unit. This is as opposed to a rigid duct system were rooms are supplied off a main duct (usually metal) which tappers as each room is tee’d off. In this design all the ducts were flexible 90mm polythene food grade plastic. The floor structure was specified as ‘Posi-Strut’ joists to allow for the ducting to run horizontally through the floor joists. Only the duct to the lounge and the master bedroom fall outside of the posistrut zone and therefore they were run as flat ducting under the lower roof trusses. Downstairs all the outlets and intakes are located on the ceiling of the rooms. Upstairs the supplies to the bedrooms are floor mounted and the bathroom returns is located on one of the internal walls.



1 Upper Floor Ventilation Plan
A1-03 Scale 1:50



2 Lower Ventilation Plan
A1-03 Scale 1:50

Construction photos showing installation of ducting within Posi Struts

11. MVHR - Lüftungsgerät

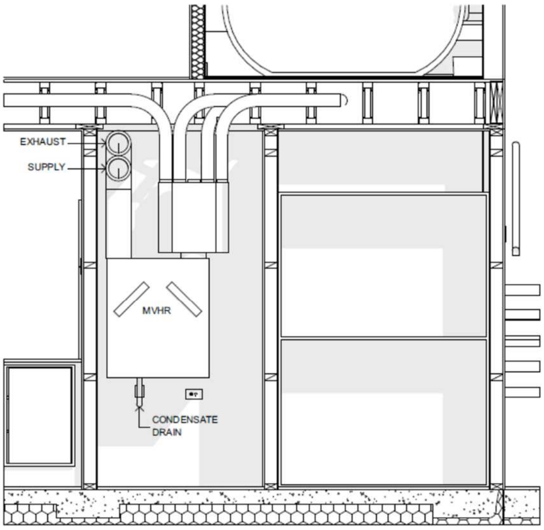
The location of the ventilation unit itself was also planned at a very early stage in the design process. The intension was to locate the unit in an accessible, central location to make changing the filters easy and to reduce the length of duct runs. It was also located to have good access to the outside air to reduce the length of the intake and exhaust pipes.

The system specified was a Zehnder Comfoair Q350. This system has an effective heat recovery of 86%. The unit was located in the scullery as this location which best fulfilled the above requirements. Boost switches were installed in each bathroom and cables run back to the main unit. This allows occupants to boost the system during showers or whenever higher than average airflows are required. The system can also be control via a smart phone app.

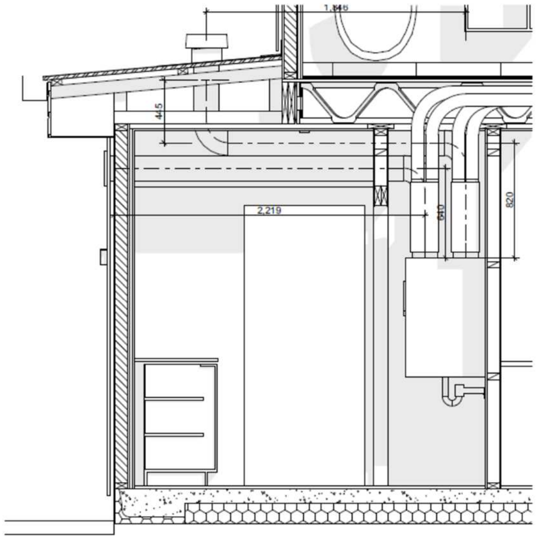
Supply air for the house comes from a grille located under the eaves on the south side of the house. Exhaust air is vented through a roof vent in the same area (see drawing below).

Door requiring undercuts are marked in red on the ventilation drawings. Undercutting the doors allows air from positively pressurised spaces (like bedrooms and living areas) to move through to negatively pressurised spaces (like bathrooms and the kitchen and laundry) where the air is returned

to the main ventilation unit for heat recovery and exhaust.



3 - **MVHR Room Elevation**
Scale 1:20



4 - **MVHR Section**
Scale 1:20

Zehnder Comfoair Q350 with external supply and return to left and silencers/manifolds to the right separating to each room.

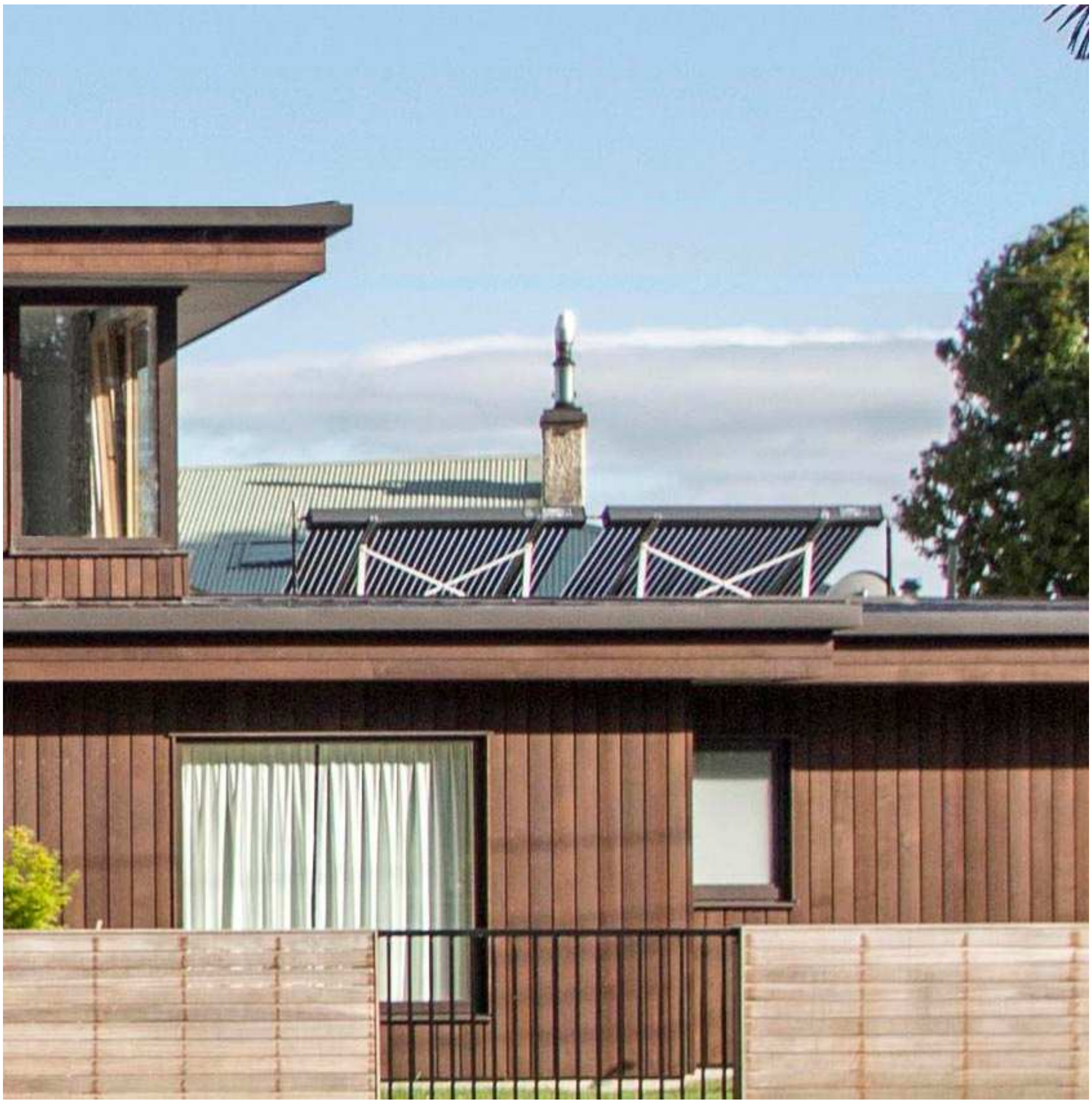
12. Heating systems - Wärmeversorgung

Heating and cooling for the house was supplied via a Daikin FTXS46L heat pump. This system can provide a maximum of 4.6kw cooling and 5.4kw heating. The selected model was a high wall unit mounted in the living area.

Daikin FTXS46L

13. Domestic Hot Water System - Heißwassersystem

Hot water for the home is provided by 2x Apricus 30 tube evacuated solar collectors. These collectors are installed facing north on frames at a 20 degree angle. The hot water is stored in a 300L insulated storage tank near the main entry.



2x Apricus 30 tube evacuated solar collectors

14. Building costs - Baukosten

No data provided

15. Publications featuring the building - Literatur

None

16. PHPP-Ergebnisse

Passive House Verification

Building:	Browne Residence
Street:	[illegible]
Postcode/City:	3434 Dunedin
Province/Country:	NZ-New Zealand
Building type:	Dwelling
Climate data set:	NZ0010a-Hamilton / Ruakura
Climate zone:	4: Warm-temperate; Altitude of location: 68 m
Home owner / Client:	[illegible]
Street:	[illegible]
Postcode/City:	[illegible]
Province/Country:	[illegible]

Architecture:	Architype NZ	Mechanical engineer:	Fantech NZ
Street:	7 Bath Street	Street:	7 Lovell Court, Rosedale
Postcode/City:	9016 Dunedin	Postcode/City:	632 Auckland
Province/Country:	Otago NZ-New Zealand	Province/Country:	New Zealand
Energy consultancy:	Architype NZ	Certification:	Jason Quinn - Sustainable Engineering
Street:	7 Bath Street	Street:	76 Viriginia Road
Postcode/City:	9016 Dunedin	Postcode/City:	4500
Province/Country:	Otago NZ-New Zealand	Province/Country:	New Zealand

Year of construction:	2017	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]:	2.3	IHG cooling case [W/m²]:	2.7
No. of occupants:	3.1	Specific capacity [Wh/K per m² TFA]:	77	Mechanical cooling:	

Specific building characteristics with reference to the treated floor area

				Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area m²	207.6				
Space heating	Heating demand kWh/(m²a)	14.77	≤	15	-	yes
	Heating load W/m²	13.30	≤	-	10	
Space cooling	Cooling & dehum. demand kWh/(m²a)	-	≤	-	-	-
	Cooling load W/m²	-	≤	-	-	
	Frequency of overheating (> 25 °C) %	0	≤	10		yes
	Frequency of excessively high humidity (> 12 g/kg) %	0	≤	20		yes
Airtightness	Pressurization test result n_{50} 1/h	0.3	≤	0.6		yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	87	≤	120		yes
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	42	≤	-	-	-
	Generation of renewable energy (in relation to projected building footprint area) kWh/(m²a)	6	≥	-	-	

[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:
1-Designer	Tim	Ross	
	Issued on:	City:	