

1 Abstract | Zusammenfassung



Figure 1 North and West Elevations of Dwelling,
Nord und Westansichten der Wohnung

ID 5849 - Swan Residence

1.1 Data of building | Gebäudedaten

Year of construction Baujahr	2018	Space heating demand Heizwärmebedarf	10.4 kWh/(m²a)
U-value external wall U-Wert Außenwand	0.221 W/(m²K)		
U-value floor U-Wert Boden	0.342 W/(m²K)	Primary Energy Renewable (PER) Erneuerbare Primärenergie (PER)	26 kWh/(m²a)
U-value roof (first floor) (ground floor) U-Wert Dach (erster Stock) (Erdgeschoss)	0.158 0.106 W/(m²K)	Generation of renewable Energy Erzeugung erneuerb. Energie	46 kWh/(m²a)
U-value window U-Wert Fenster	1.1 W/(m²K)	Non-renewable Primary Energy (PE) Nicht erneuerbare Primärenergie (PE)	52 kWh/(m²a)
Heat recovery Wärmerückgewinnung	81.8 %	Pressurization test n Drucktest n ₅₀	0.52 h ⁻¹
Special features Besonderheiten	Shower Drain Heat Recovery units / Duschaabfluss- Wärmerückgewinnungsgeräte Heat Pump Hot Water System / Wärmepumpe Warmwassersystem Solar PV with micro-inverters / Solar PV mit Mikro-Wechselrichtern		

1.2 Brief Description

ID 5849 - Swan Residence

This project is a single detached dwelling for private clients. The site is located in the existing village of Paengaroa, near Te Puke in the Bay of Plenty. The 2-storey house faces true north and has a separate double garage accessed via a carport to the south of the house.

Kurzbeschreibung

ID 5849 - Schwanenresidenz

Dieses Projekt ist eine freistehende Wohnung für Privatkunden. Der Standort befindet sich im bestehenden Dorf Paengaroa in der Nähe von Te Puke in der Bay of Plenty. Das 2-stöckige Haus ist nach Norden ausgerichtet und verfügt über eine separate Doppelgarage, die über einen Carport im Süden des Hauses zugänglich ist.

1.3 Responsible project participants

Verantwortliche Projektbeteiligte

Architect Entwurfsverfasser	Julie Swan, Team-Swan Design Ltd www.teamswan.co.nz
Implementation planning Ausführungsplanung	Julie Swan, Team-Swan Design Ltd www.teamswan.co.nz
Building systems Haustechnik	Julie Swan, Team-Swan Design Ltd www.teamswan.co.nz
Structural engineering Baustatik	BCD Group Ltd
Passive House project planning Passivhaus-Projektierung	Julie Swan, Team-Swan Design Ltd www.teamswan.co.nz
Construction management Bauleitung	John Swan, Team-Swan Ltd www.teamswan.co.nz
Certifying body Zertifizierungsstelle	
Sustainable Engineering Ltd www.sustainableengineering.co.nz	
Certification ID Zertifizierungs ID	
5849	Project-ID (www.passivehouse-database.org) Projekt-ID (www.passivhausprojekte.de)

Author of project documentation Verfasser der Gebäude-Dokumentation

Julie Swan, Team-Swan Design Ltd
www.teamswan.co.nz

Date Datum	Signature Unterschrift
22/01/2021	

2. Exterior photos - Ansichtsfotos



Figure 2 North elevation of dwelling



Figure 3 South and East elevations of dwelling (prior to completion and construction of carport)



Figure 4 West and South elevations of dwelling, carport and garage

3. Interior photos - Innenfoto exemplarisch



Figure 5 Living area

4. Sections - Schnittzeichnung

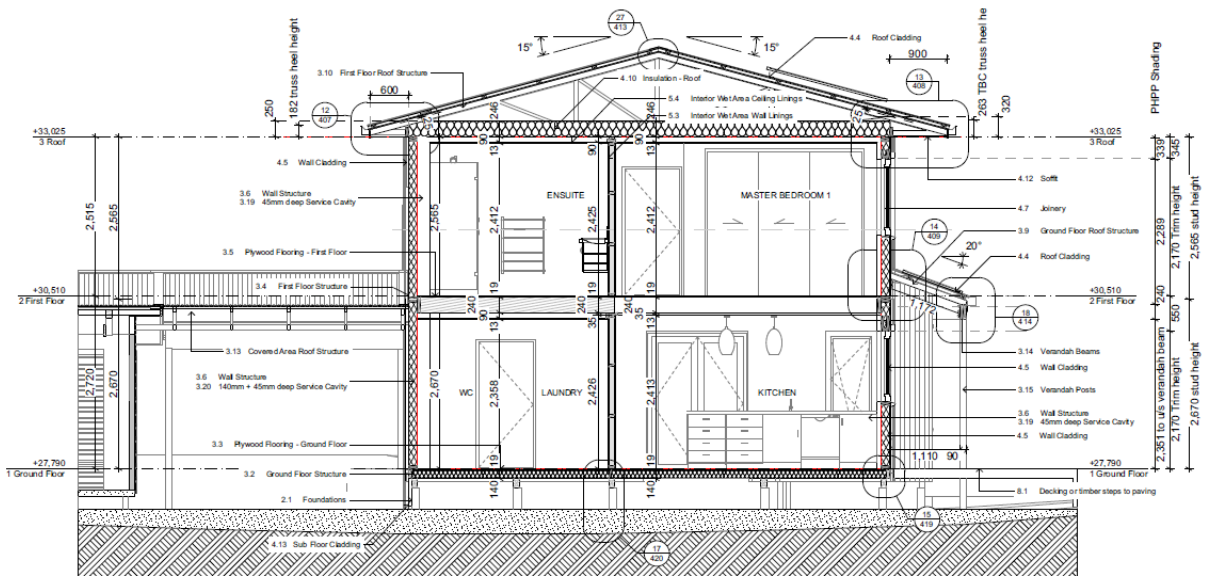
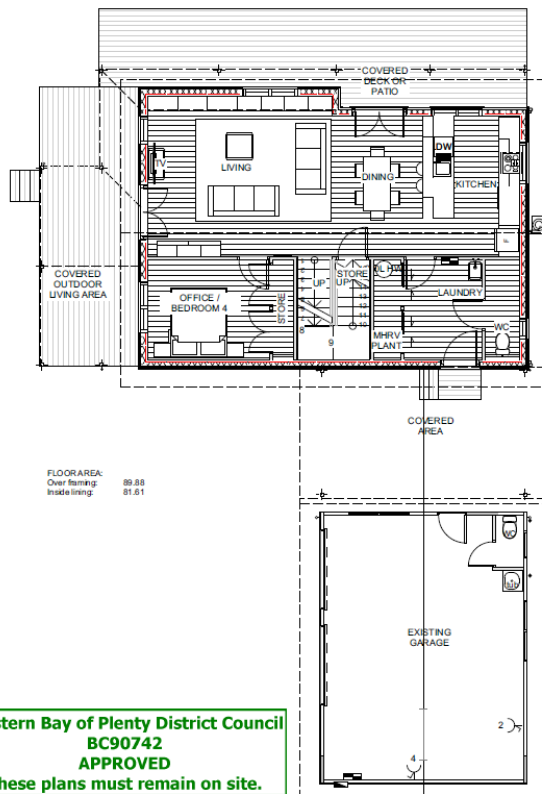


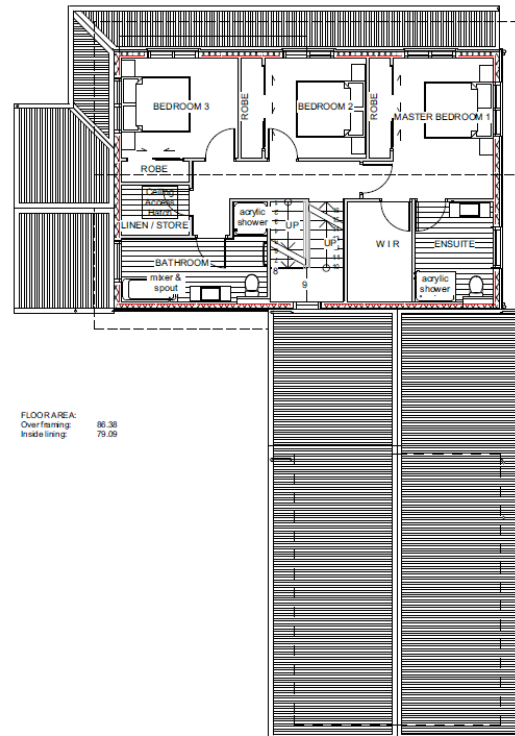
Figure 6 Typical Section

The thermal envelope is a fairly simple rectangular box, with a small area of ground floor in the living area protruding beyond the 2-storey rectangle. The carport is a self supporting, engineered design adjacent to the dwelling outside of the thermal & weathertight envelope and adjacent to the garage.

5. Floor plans - Grundrisse



1 Ground Floor Overview 1:100



2 First Floor Overview 1:100

The ground floor contains the living area, dining area, kitchen, multipurpose room – bedroom / office / media room, downstairs toilet with space for an additional shower, laundry and plant cupboard which houses the MHRV unit and hot water cylinder.

The first floor contains 3 double bedrooms, family bathroom, line cupboard, master ensuite and walk-in wardrobe.

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

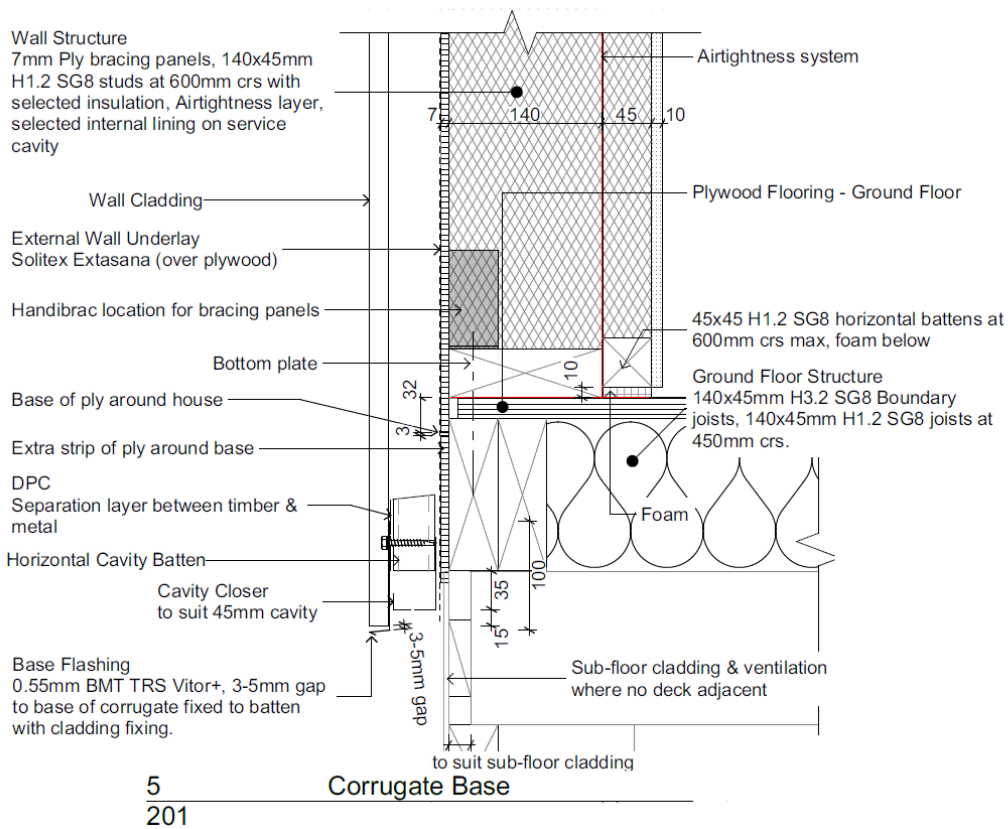


Figure 7 Typical floor slab edge and base of wall cladding

The ground floor is a timber construction: 140x45mm joists at 450mm centres with 2 layers of insulation between the joists, (either 2 x layers of R1.8, 75mm thick glasswool batts with wind wash in areas of plumbing and drainage pipes, U-value 0.342 W/(m²K) or 2 layers of semi-rigid Polyester sections, 90mm & 55mm thick, between the joists with an additional layer of R1.8, 75mm thick glasswool batts with wind wash perpendicular to and under the joists (not shown in above detail), U-value 0.221 W/(m²K)).



Figure 9 2 layers of Polyester underfloor sections between joists



Figure 8 Additional layer of glasswool insulation with windwash, perpendicular to and under the joists

7. Wall construction including insulation - Konstruktion der Außenwände

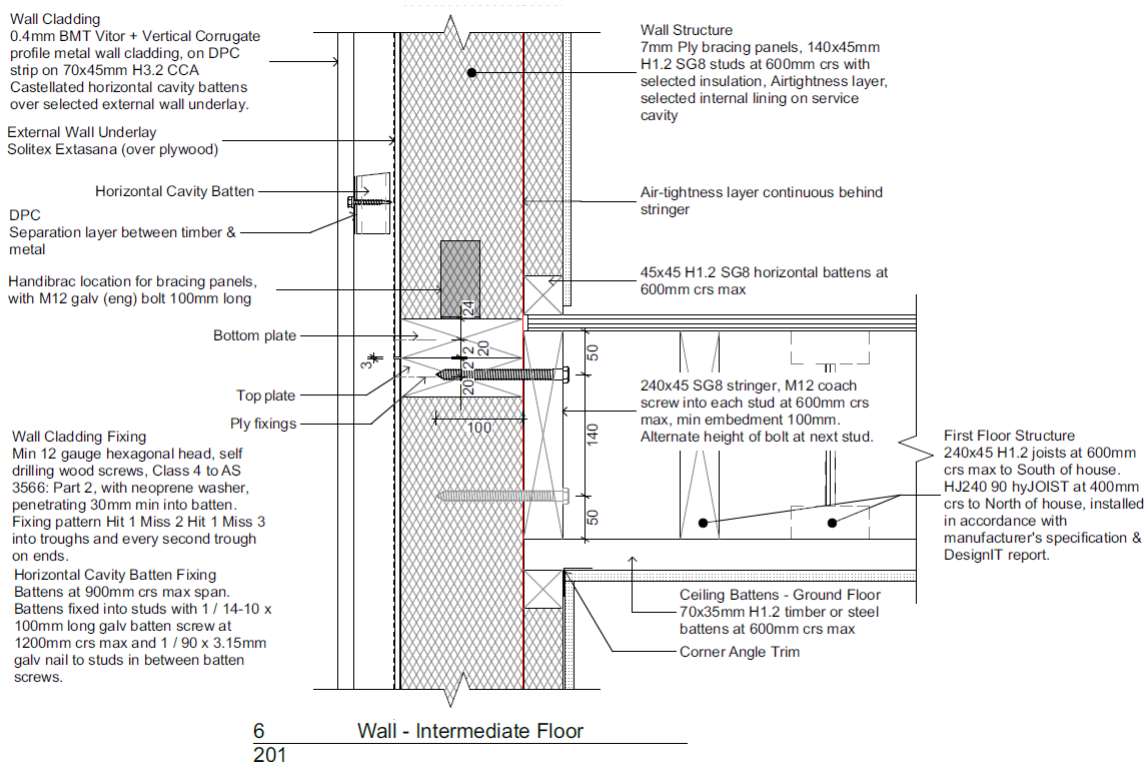


Figure 10 Typical external wall and mid-floor detail

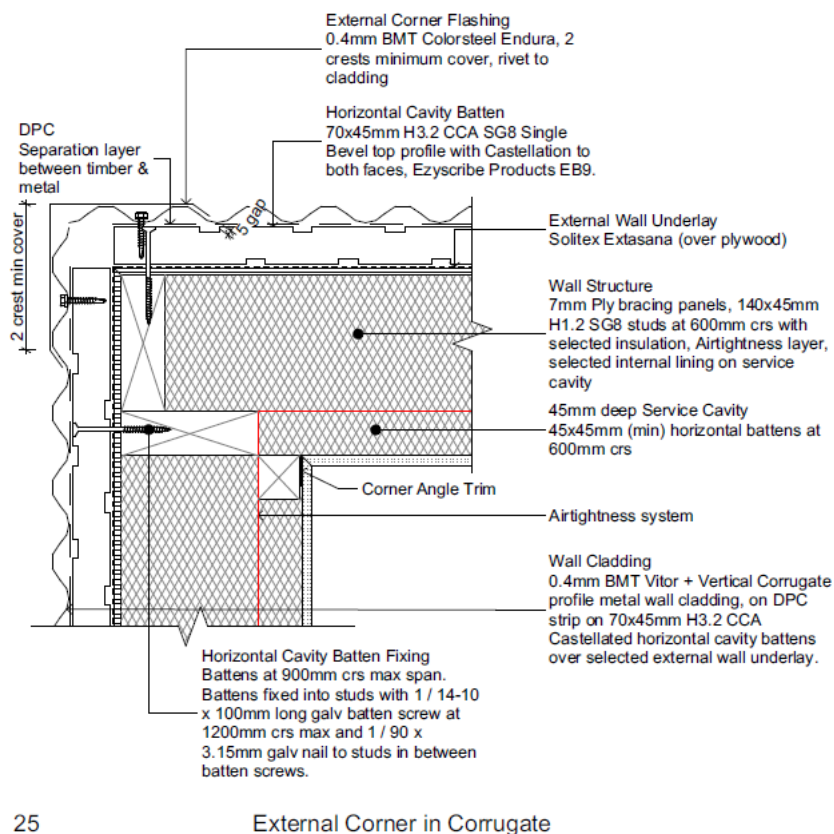


Figure 11 External corner detail

The external walls were constructed with 7mm plywood for bracing on 140x45mm studs at 600mm centres, no nogs, filled with 140mm thick glasswool batt segments. Inside this is an Intello airtightness layer and 45x45mm horizontal battens at 600mm centres filled with 45mm thick glasswool batts. Inside this is the plasterboard lining. The external cladding is 0.4mm BMT profiled metal corrugate cladding on castellated horizontal structurally fixed battens over the wall underlay on the 7mm plywood. U-value 0.221 W/(m²K).



Figure 13 Insulation to the wall studs



Figure 12 Typical Intello airtightness layer installed to the wall studs and first floor ceiling, with joints taped



Figure 14 Insulation to the horizontal service cavity inside the airtightness layer

8. Roof construction including insulation - Konstruktion des Daches

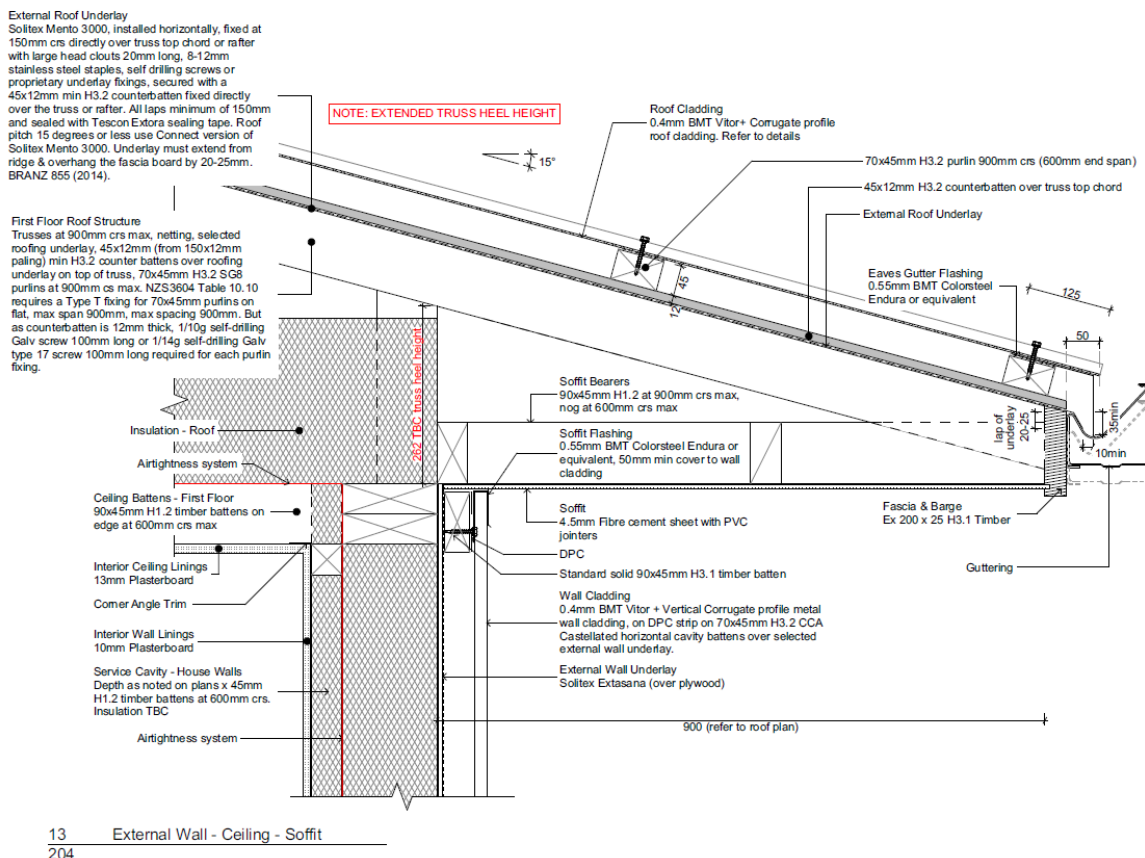


Figure 15 Typical roof to external wall detail

The roof structure has timber trusses at 900mm centres, with 2 layers of insulation; 130mm thick glasswool batt segments between the truss bottom chords (and taken over the wall top plate) and a 150mm layer of glasswool blanket above this running perpendicular to the truss bottom chords. The ceiling batten space between the Intello airtightness layer and ceiling plasterboard is not insulated. The external roof cladding is 0.4mm BMT profiled metal corrugate cladding on purlins on a counterbatten over the roofing underlay on the truss top chords. U-value 0.158 W/(m²K).



Figure 17 Roof / ceiling insulation



Figure 16 2 layers of insulation to roof space



Figure 18 Roof purlins on counterbattens on roofing underlay

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

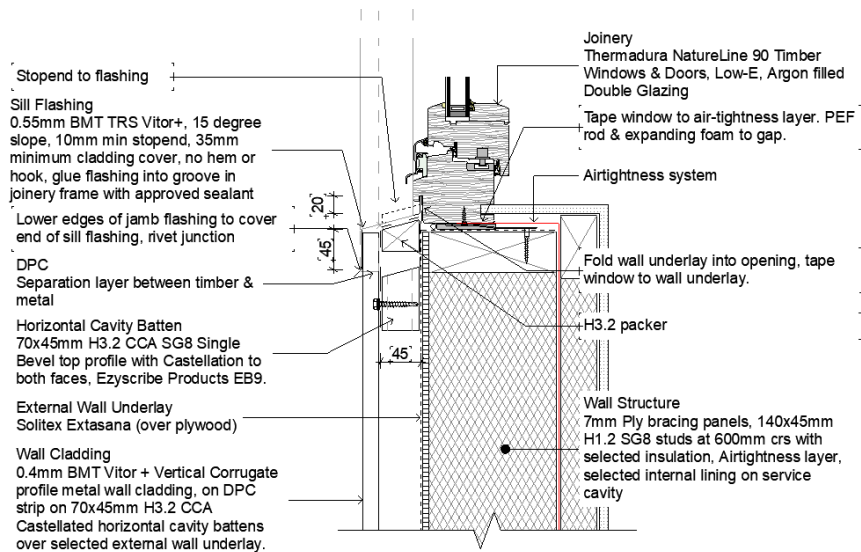


Figure 19 Typical Window Sill Detail

The windows are Thermadura Natureline 90, Siberian Larch timber frames, $U_f = 1.1 \text{ W/(m}^2\text{K)}$, double glazed 4/18/4, with Argon and low-e glazing with thermal spacer $U_g = 1.14 \text{ W/(m}^2\text{K)}$, g-Value 0.64. These windows also have continuous double air seals.



Figure 21 Window taped & fixing brackets attached



Figure 20 Window installed and taped to Intello airtight layer on wall framing



Figure 22 External view of window taped in place

10. Air leakage testing - Beschreibung der luftdichten Hülle

The main airtightness layer is Pro-Clima Intello attached to the inside of the structural wall framing and roof trusses / ceiling framing. This is taped around the windows and doors. All joints in the Intello are taped. There is a 45mm deep service cavity inside the Intello and any services penetrating the airtight layer use proprietary sealing grommets. The ground floor plywood flooring is also part of the airtight layer, with all joints tape sealed. The Intello on the walls is tape sealed to plywood floor.

The airtight layer is indicated by the red line in the previous details.

Pressure test n50 result was 0.52 h^{-1} . This was carried out by Alexander & Co Ltd.

On Site Air Tightness Test Report

Address	Paengaroa
Date of test	31 October 2018
Project reference	3400
Tested by	Steve Alexander

Test Result

Pressure	Depressurisation	Pressurisation	Average
50 Pa	0.47 ACH	0.57 ACH	0.52



Figure 24 Typical Air Seal – Pipe to plywood floor



Figure 23 Blower Door Test in progress

11. MVHR Ventilation Unit - Lüftungsgerät

A Zehnder ComfoAir Q350 heat recovery ventilation unit was installed, with ComfoWell attenuators and 90mm ComfoTube ducting to ceiling grilles.

The effective heat recovery efficiency was 81.1%.

The electrical efficiency is 0.29 Wh/m³.



Figure 26 Zehnder ComfoAir Q350 during installation



Figure 25 Zehnder ComfoWell attenuators above central unit

12. Ventilation ductwork - Lüftungsplanung Kanalnetz

The ground floor MVHR ductwork (and water supplies to the first floor) were installed in the intermediate floor, which were hyJoists with allowable holes designed into the floor structure. The first floor MVHR ductwork were installed in a deep first floor ceiling cavity within the airtight layer.

The MVHR unit was located on the ground floor adjacent to the South external wall. Exhaust air was expelled above the Fresh Air Intake to the unit on the South Elevation.

Grilles / valves, in the ceilings, were used to set the required level of air supply to the bedrooms and living rooms and extract air was taken from the kitchen, laundry and bathrooms.

Air is returned / circulates via undercut doors to bedrooms and above bathroom / ensuite door lintels.

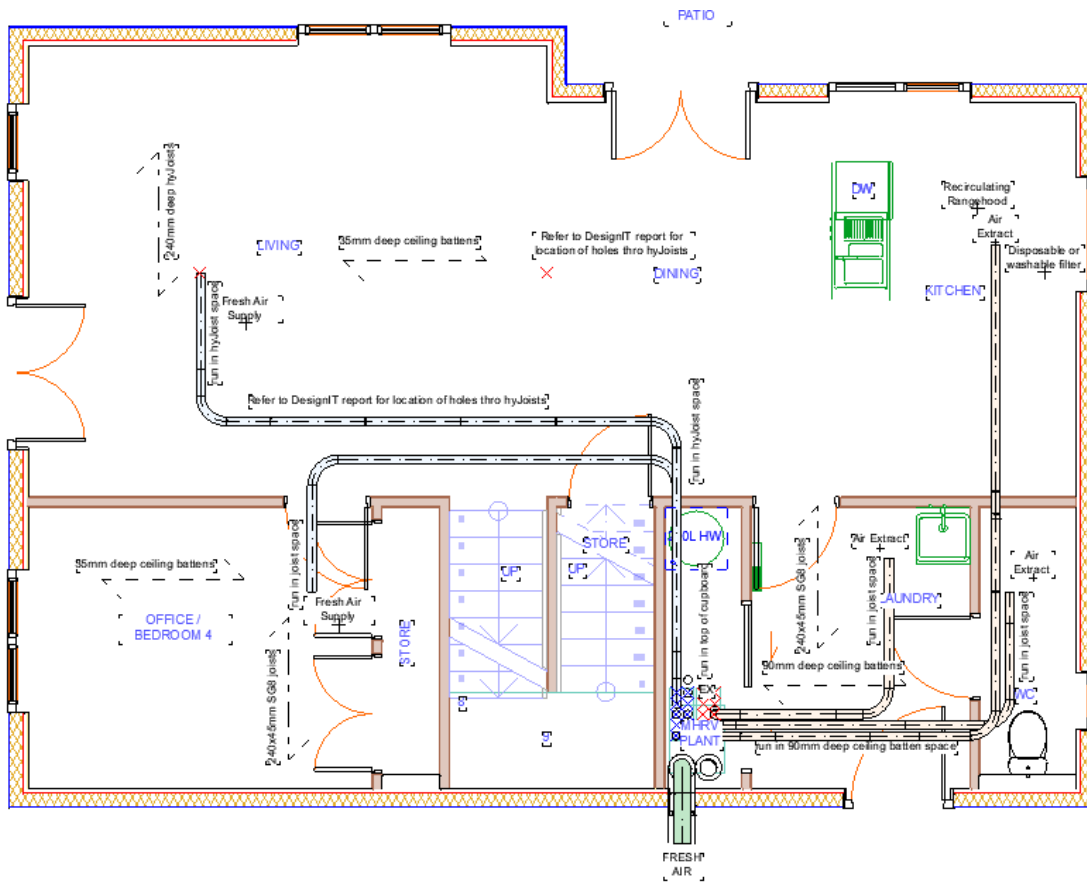


Figure 27 Ground floor HRVU duct layout

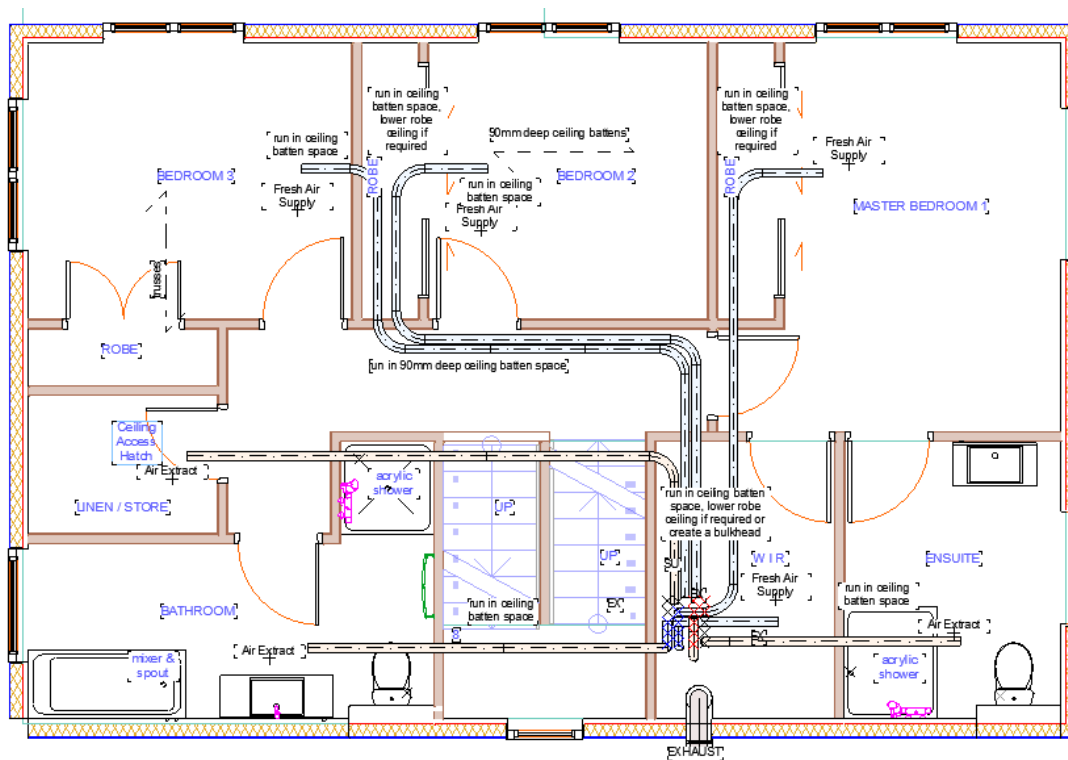


Figure 28 First floor HRVU duct layout

13. Heating systems - Wärmeversorgung

There is a Mitsubishi MSZ-GL35VGD-A1 - DC Inverter R32 Wall Mount Heat Pump in the living room to provide heating and cooling.



Figure 30 Living room heat pump (wall mount)



Figure 29 Main bathroom heated towel rail

There are also (direct electric) heated towel rails in the main bathroom and master ensuite to provide heating if required during winter.

Domestic water heating is supplied by an external Econergy HP4000LT heat pump to a 250L cylinder, within the thermal envelope.

14. PHPP-Ergebnisse



Passive House Verification									
				Building: Swan Residence Street: <input type="text"/> Postcode/City: 3189 Paengaroa Province/Country: Bay of Plenty NZ-New Zealand Building type: Single Family Residence Climate data set: us-01-NZ0914(a)-Rotorua Climate zone: 5: Warm Altitude of location: 26 m					
				Home owner / Client: <input type="text"/> Street: <input type="text"/> Postcode/City: <input type="text"/> Province/Country: <input type="text"/>					
				Main Contractor: John Swan Street: <input type="text"/> Postcode/City: 3189 Paengaroa Province/Country: Bay of Plenty NZ-New Zealand					
				Certification: Sustainable Engineering Ltd, Jason Quinn Street: 76N Virginia Rd Postcode/City: 4500 Whanganui Province/Country: Manawatu - Whanganui NZ-New Zealand					
Architecture: Team-Swan Design Ltd Street: <input type="text"/> Postcode/City: 3189 Paengaroa Province/Country: Bay of Plenty NZ-New Zealand Energy consultancy: Julie Swan Street: <input type="text"/> Postcode/City: 3189 Paengaroa Province/Country: Bay of Plenty NZ-New Zealand				Year of construction: 2018 No. of dwelling units: 1 No. of occupants: 2.9					
				Interior temperature winter [°C]: 20.0 Interior temp. summer [°C]: 25.0 Internal heat gains (IHG) heating case [W/m²]: 2.4 IHG cooling case [W/m²]: 2.7 Specific capacity [Wh/K per m² TFA]: 60 Mechanical cooling: <input type="text"/>					
Specific building characteristics with reference to the treated floor area									
		Treated floor area m²	145.6						
Space heating	Heating demand kWh/(m²a)	10.42	≤	15	-			Fulfilled?²	yes
	Heating load W/m²	8.43	≤	-	10				
Space cooling	Cooling & dehum. demand kWh/(m²a)	-	≤	-	-			-	
	Cooling load W/m²	-	≤	-	-				
	Frequency of overheating (> 25 °C) %	3.69	≤	10				yes	
	Frequency of excessively high humidity (> 12 g/kg) %	0.27	≤	20				yes	
Airtightness	Pressurization test result n ₅₀ 1/h	0.52	≤	0.6				yes	
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	52	≤	-				-	
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	26	≤	45	30			yes	
	Generation of renewable energy (in relation to pro- kWh/(m²a) heated building footprint area)	46	≥	60	36				
<small>² Empty field: Data missing; ▫ No requirement</small>									
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.									
Task:		First name:		Surname:		Passive House Plus?		yes	
2-Certifier		Jason		Quinn		Signature:			
20832_GENZ_PH_20190415_JEQ		Certificate ID		Issued on:		City:		Whanganui	

Figure 31 PHPP Verification sheet

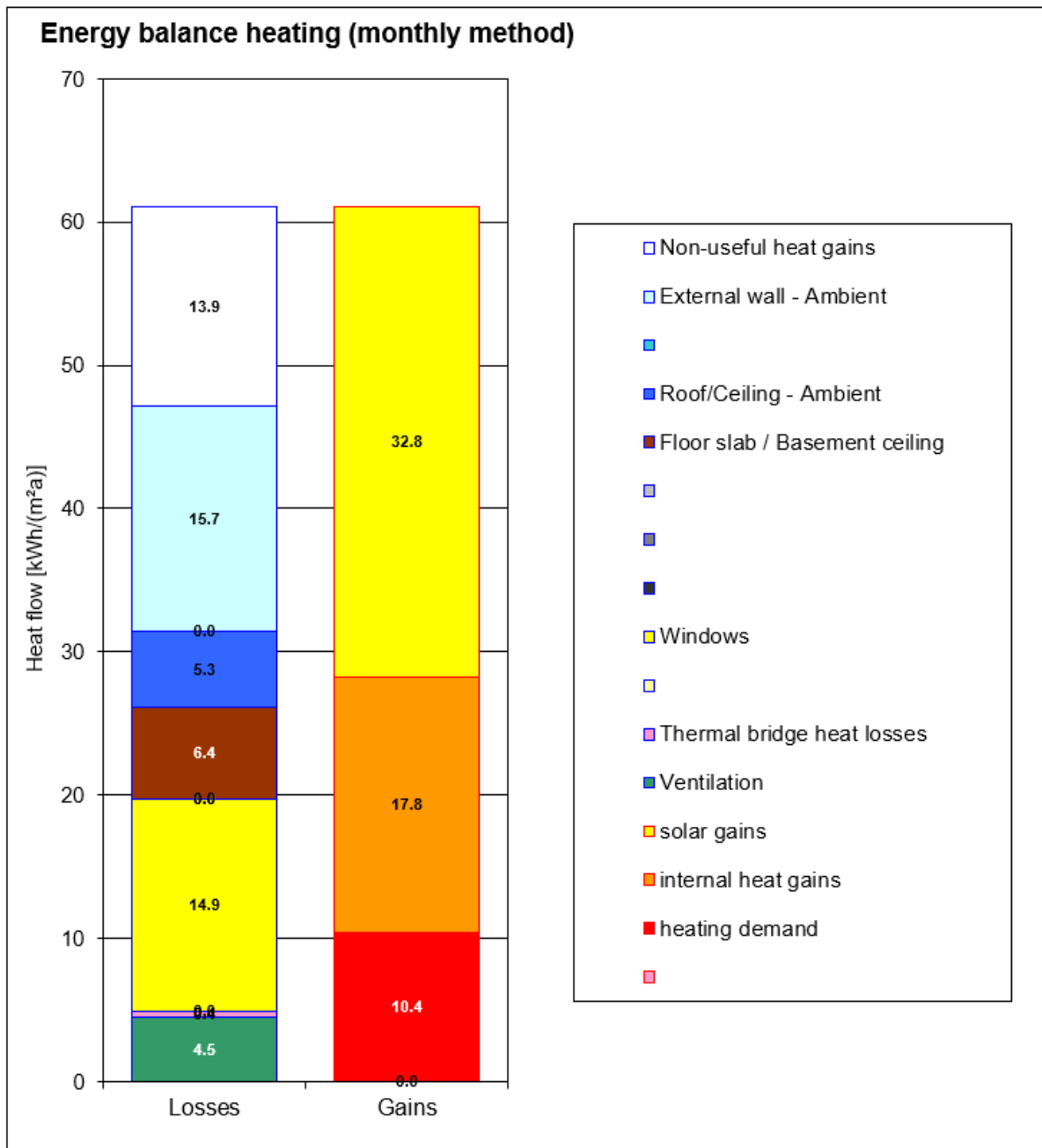


Figure 32 PHPP Heating Tab

The majority of the heat gain is from solar gains. With a predicated frequency of overheating of 3.69% and having lived in the home for 18 months or so, additional external shading has been added post certification to help control the amount of solar gain in summer months in particular to the west facing windows and French doors.

15. Building costs & Year of Construction- Baukosten & Baujahr

The construction commenced in Dec 2017 and was completed in Oct 2018. The clients wish for the construction costs to remain private.