Passive House Project Documentation

Waitetuna Passive House, Raglan 3295, New Zealand.
PHI ID: 3918

1.0 Photograph of front of the house

This is the second certified Passive House in New Zealand. It is situated in a rural setting close to the coastal town of Raglan. The project brief was to build a certified Passive House with a minimalistic approach that would capture the views to the bush and windfarm. The house is two levels, with external ICF walls, timber mid-floor and roof, and a concrete slab foundation.

1.1 Building data

U-value external walls = 0.29W/m2K
U-value floor = 0.26W/m2K
U-value roof = 0.2W/m2K
U-value window frame = 0.95W/m2K
U-value window glass = 1.1W/m2K
PHPP Space Heating Demand = 4kWhr/m2 per annum
PHPP Primary Energy Demand = 89kWhr/m2 per annum
Air Test (n50) = 0.42h-1
Heat Recovery Unit Efficiency= 82.6%

1.2 Construction Task

Designed by Brooke Cholmondeley-Smith, and built John MacDonald Builders, the two-story ICF concrete building has three bedrooms, including an upstairs master bedroom. Downstairs there is a kitchen and living areas.
The building is oriented along the north-south axis with the main entry to the south and a backyard to the north. This site is a rural site 0.6648Ha in size. The house was positioned on the lower slope of the hill to gain the best views, ease of construction, and where there is less morning shade from the large hill behind the house. There are no close neighbours (by urban standards).

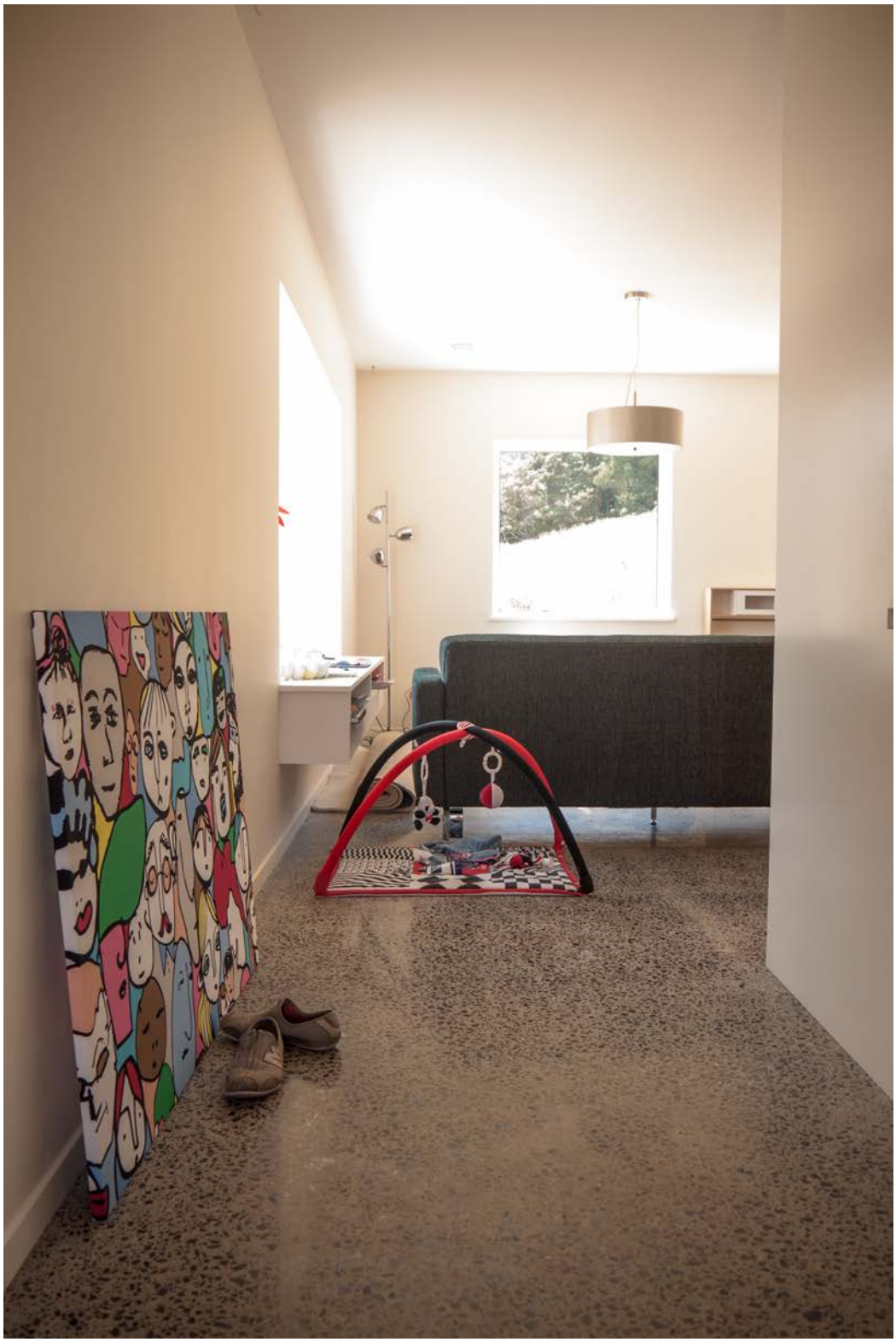
Assemblies included:

- New ICF block with 0.15m concrete reinforced core
- Timber 300 x 63mm LVL mid-floor joists
- Timber mono-pitch roof trusses

1.3 Project participants

Project ID:	3918
Architect:	Brooke Cholmondeley-Smith
Certified PH Designer:	Brooke Cholmondeley-Smith
Building Services Planner:	Brooke Cholmondeley-Smith
Builder:	John MacDonald Builders
Structural Engineer:	BCD group
Ventilation:	Fantech NZ
PH Certifier:	MosArt (Ireland)

2.0 Completed photos (Interior)



House interior, polished concrete floor, painted walls and ceiling.

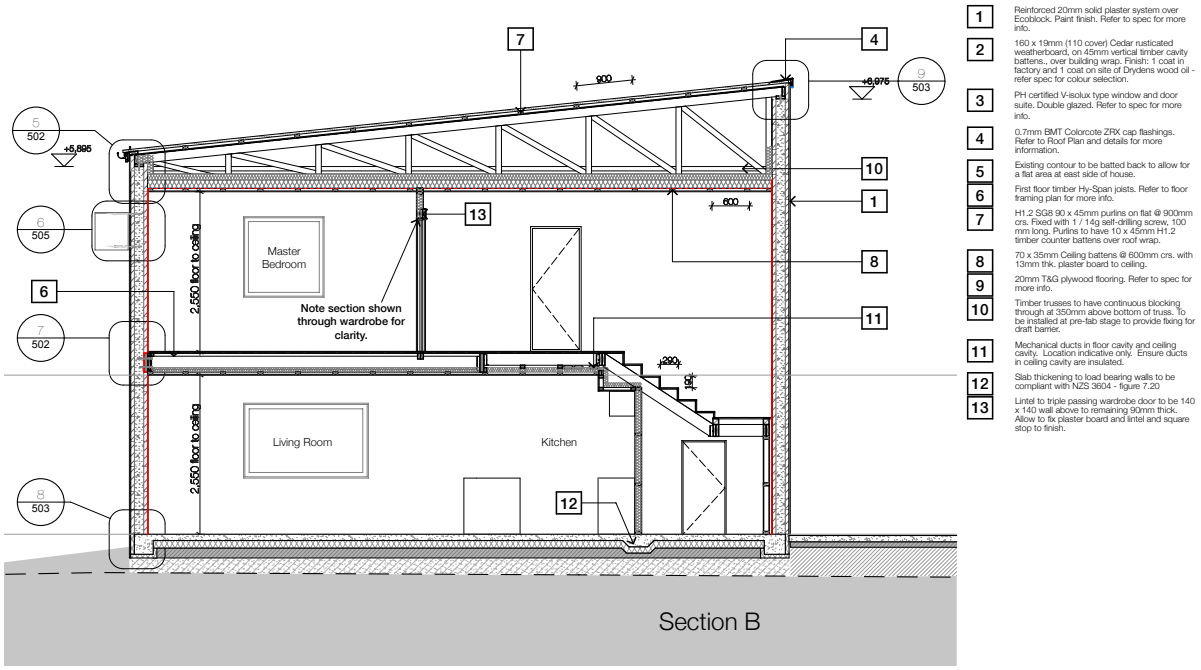
Timber stairs, painted walls and ceiling. Entrance door in back-ground.

2.0 Completed photos (Exterior)

North façade, timber deck and sunshade above window.

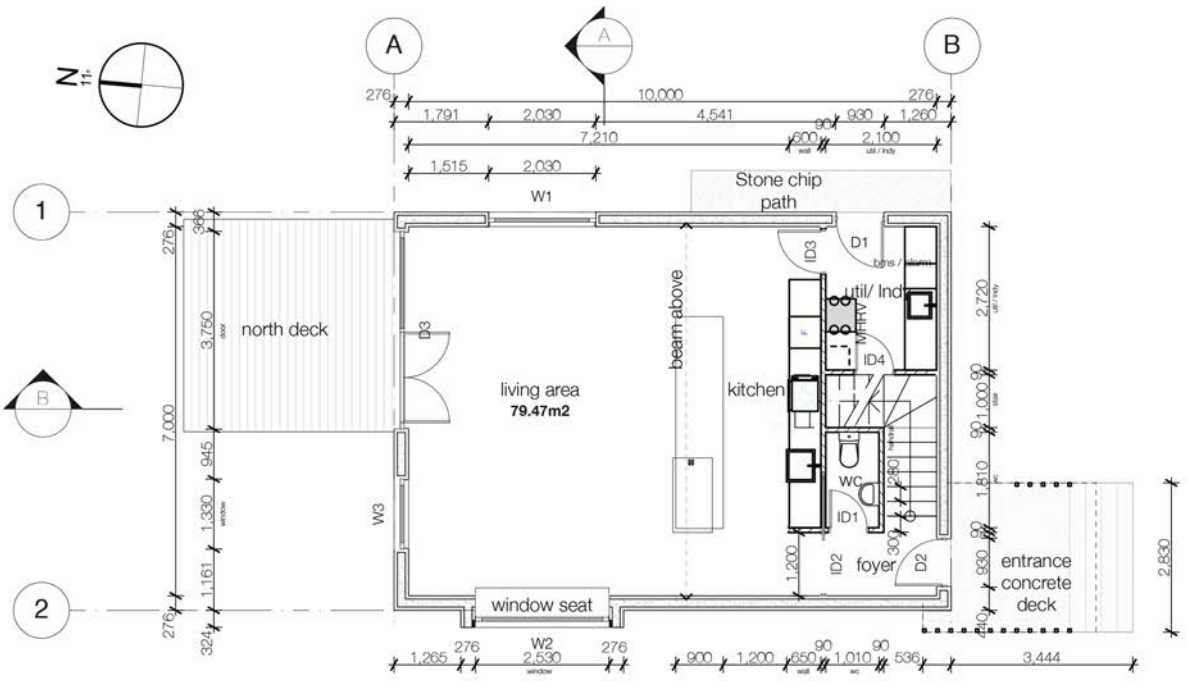
East façade, view of countryside in background.

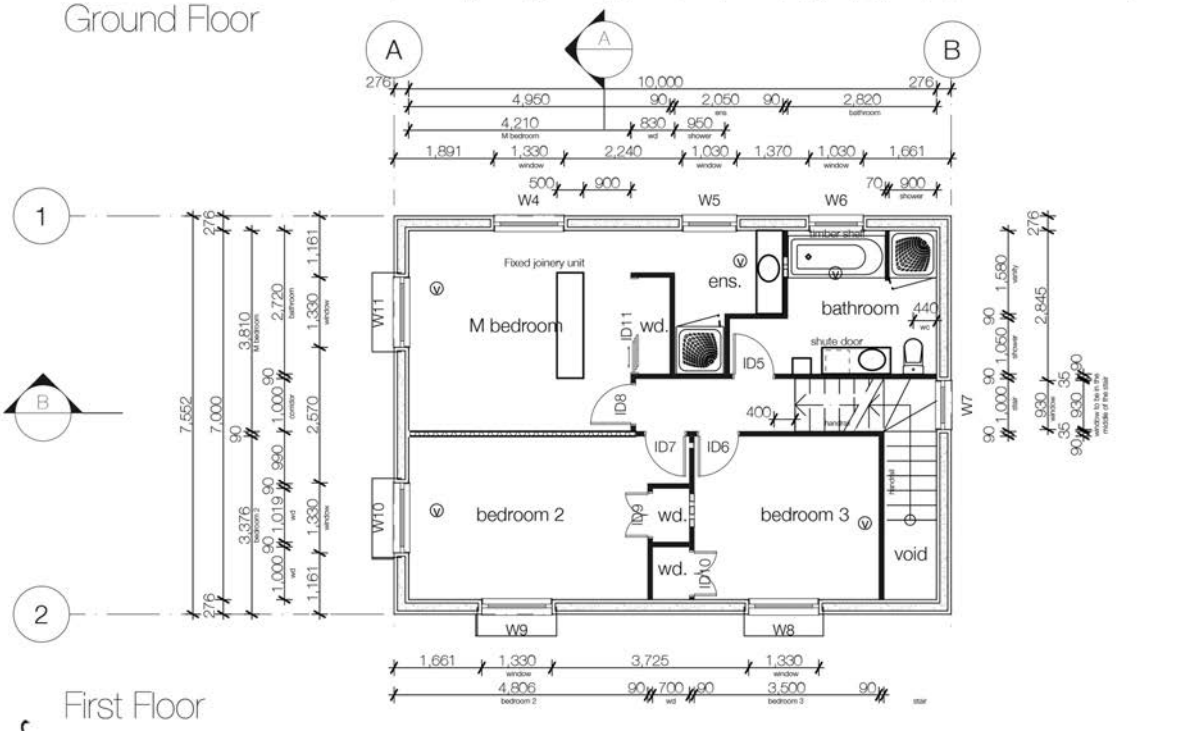
3.0 Section drawing



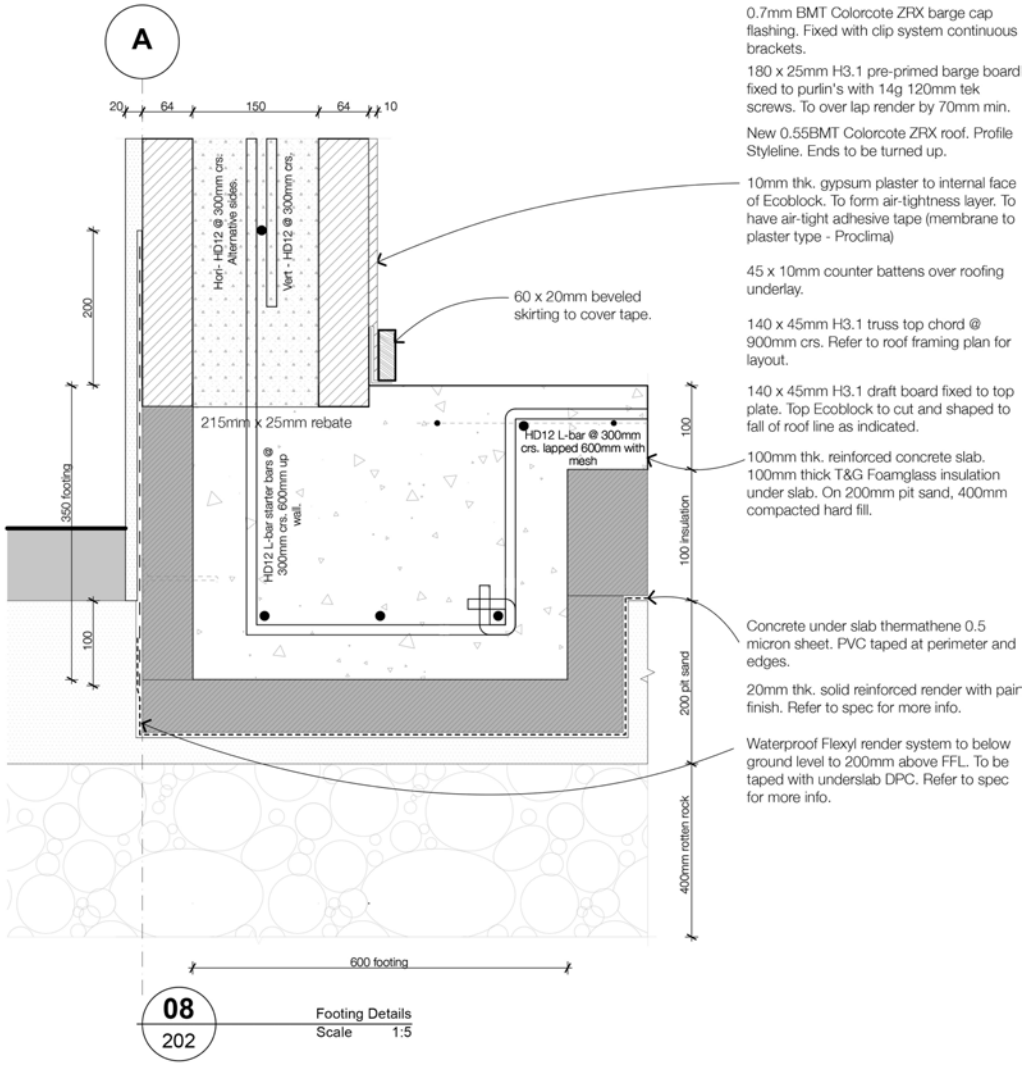
Two level house with ICF walls on a concrete slab. Roof and mid-floor timber framed.

4.0 Ground and first floor plan



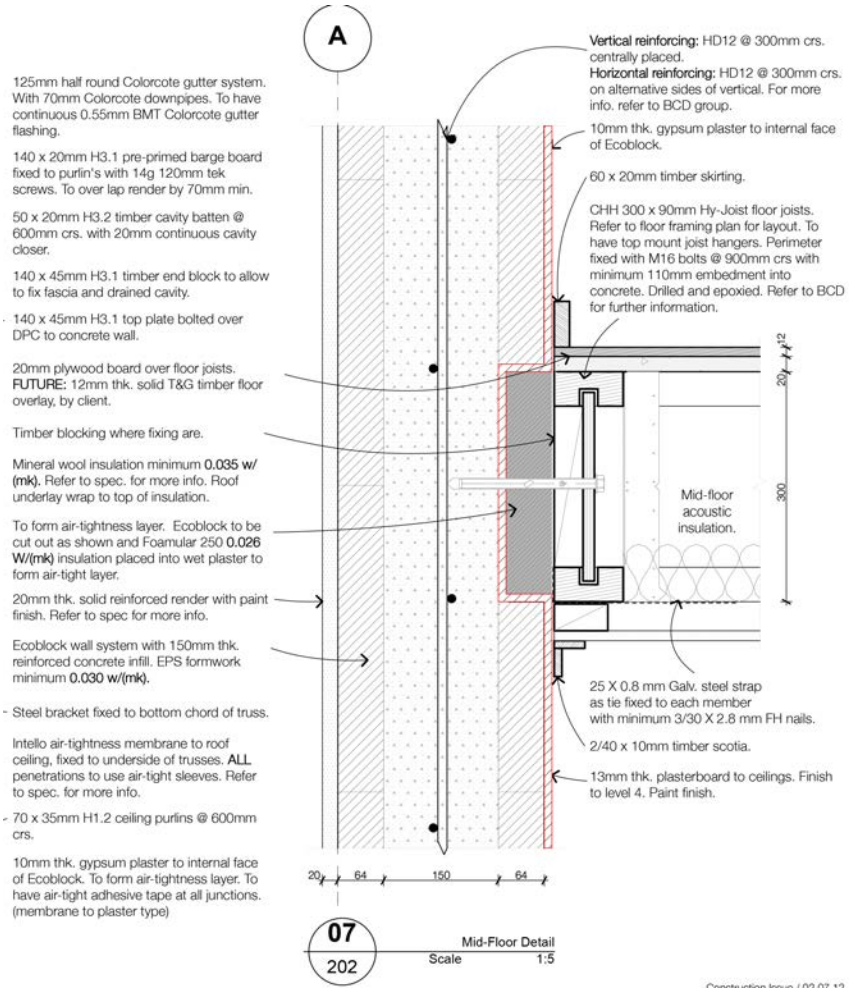


5.1 Footing/slab connection



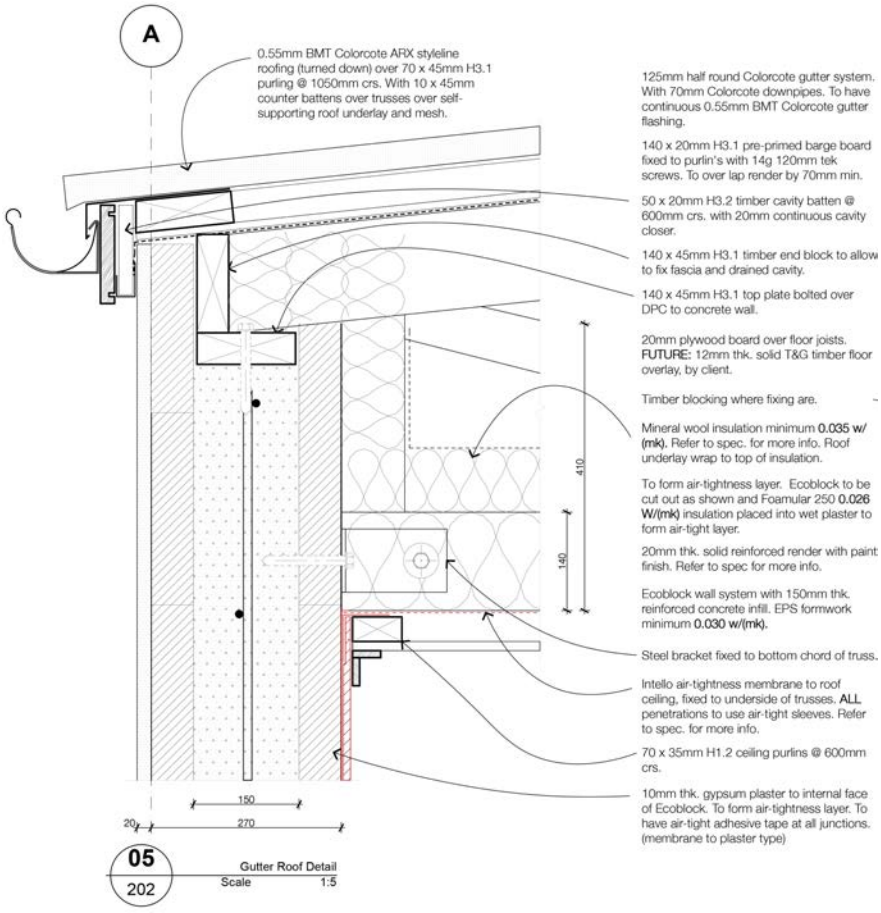
Footing isolated with ridged foam insulation, 100mm thick concrete slab and footings poured all at once. ICF block formed outer boxing of footing.

5.2 Exterior walls



The exterior walls are ICF block with a 0.150m concrete core. These walls are the total height of the building. The mid-floor is thermally isolated.

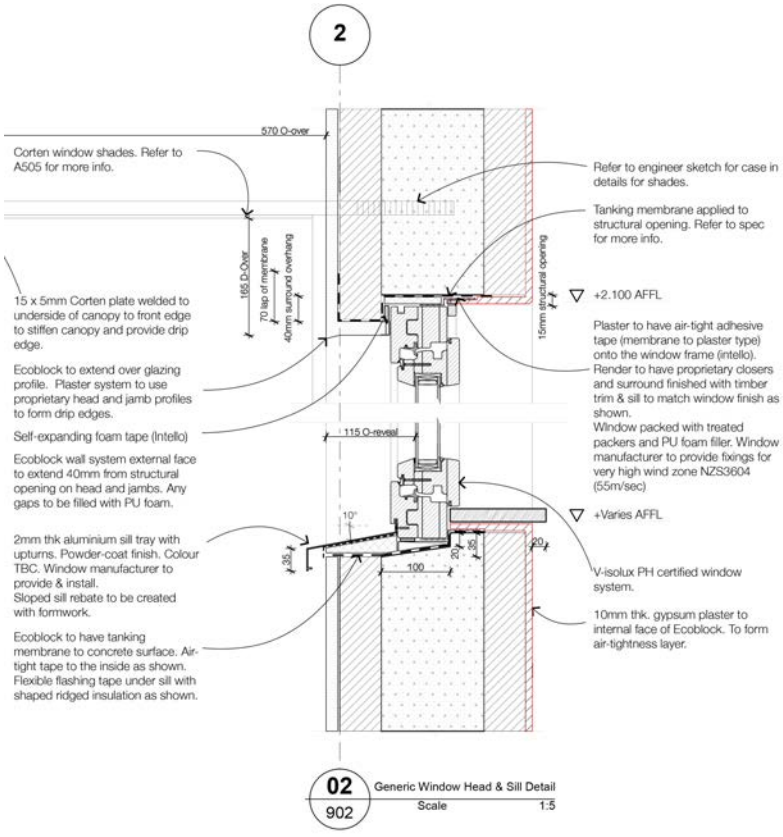
5.3 Roof



The ICF block is built to the underside of the roofing material. The timber trusses are inside the ICF to improve thermal performance. The timber trusses have two layers of thermal insulation blanket at the ceiling level. The ceiling uses an air-tight membrane to make the ceiling meet the PH air-tightness criteria.

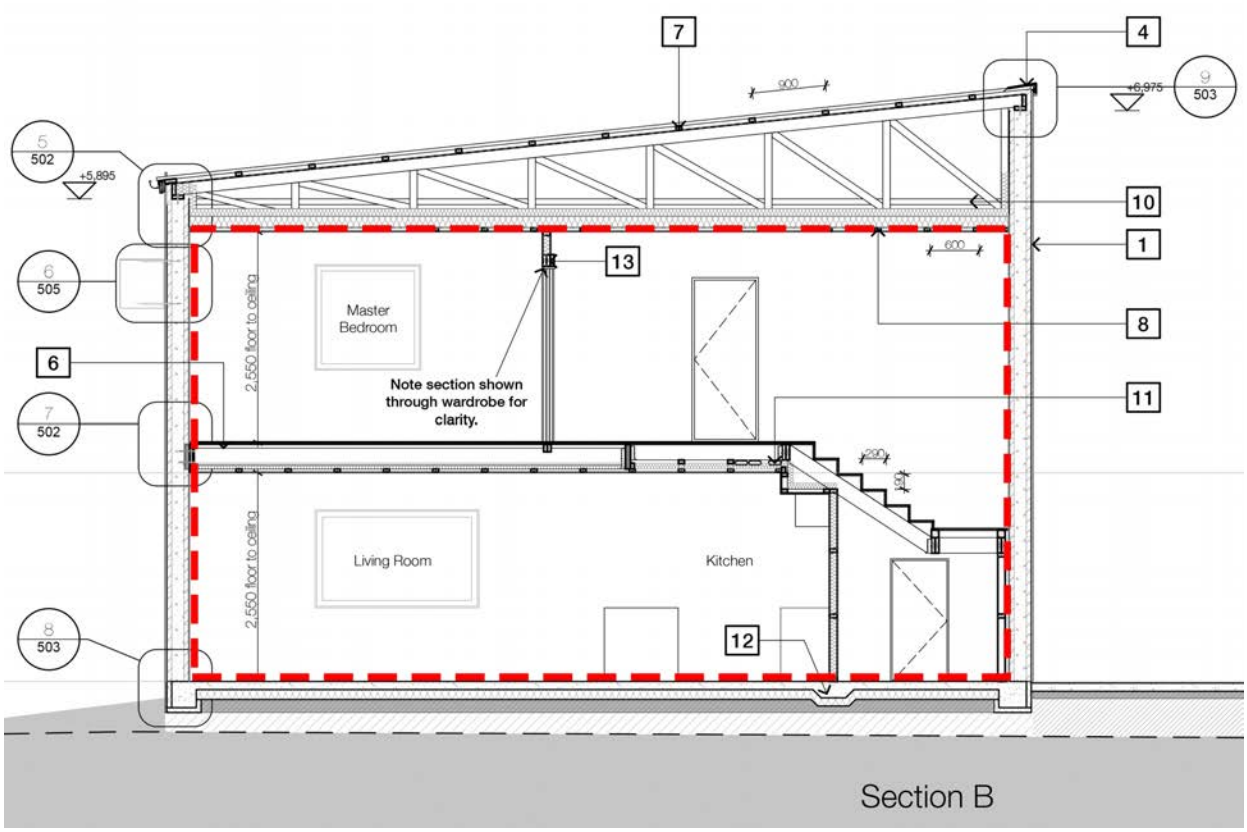
5.4 Window frame

Product frame:	V-Isolux frame, spruce with Purenit core (Uf 0.95)
Product glass (double glazed):	ISOLAR Neutralux Low-e, argon filled (Ug 1.1)
Window:	Uw 1.21W/(m2K). g value = 62%



6.0 Air-tight envelope

The air-tight envelope is created by the continuous concrete slab on ground (no basement). The walls have a continuous internal layer of wet Gypsum plaster applied to the ICF block. The ceiling has an internal air-tight membrane (Intello) installed to the underside of the timber trusses, this is then taped to the Gypsum walls at the perimeter of the ceiling. The building form, and therefore the air-tightness membrane, was keep particularly simple so to meeting the PH air-tightness criteria.



6.1 n50 Test Result (De-pressurisation)

BUILDING LEAKAGE TEST

Date of Test: 1/27/2013		Technician:	Baden Brown
Test File: Casper Depressure		Project Number:	01/2013
Customer:	Casper Valentin 1068b Old Mountain Road Raglan Hamilton, Waikato Phone: Fax:	Building Address:	Residential 1068b Old Mountain Road Raglan Hamilton, Waikato

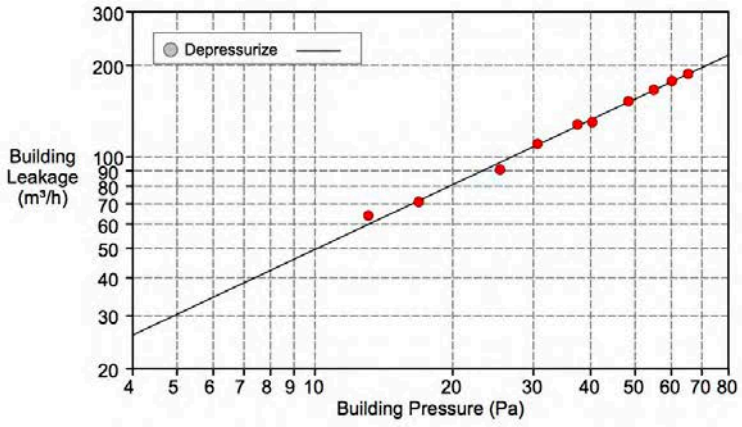
Test Results at 50 Pascals:

V50: m³/h Airflow	155 (+/- 1.5 %)
n50: 1/h Air Change Rate	0.45
w50: m³/h/m² Floor Area	1.13
q50:	

Leakage Areas: 55.2 cm² (+/- 6.1 %) Canadian EqLA @ 10 Pa
27.9 cm² (+/- 9.5 %) LBL ELA @ 4 Pa

Building Leakage Curve: Air Flow Coefficient (Cenv) = 9.7 m³/h/Paⁿ (+/- 14.8 %)
Air Leakage Coefficient (CL) = 9.7 m³/h/Paⁿ (+/- 14.8 %)
Exponent (n) = 0.709 (+/- 0.038)
Correlation Coefficient = 0.99779

Test Standard: EN 13829
Test Mode: Depressurization
Type of Test Method: A
Regulation complied with: en13829 n50 ≤ 0.6 1/h



6.2 n50 Test Result (Pressurisation)

BUILDING LEAKAGE TEST

Date of Test: 1/28/2013		Technician:	Baden Brown
Test File: Casper pressure		Project Number:	01-2013
Customer:	Casper Valentin 1068b Old Mouhtain Road Raglan Hamilton, Waikato Phone: Fax:	Building Address:	Residential 1068b Old Mouhtain Road Raglan Hamilton, Waikato

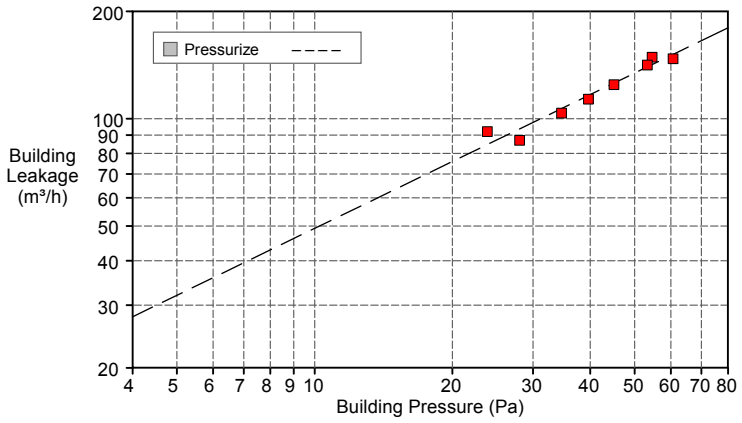
Test Results at 50 Pascals:

V50: m³/h Airflow	134 (+/- 4.2 %)
n50: 1/h Air Change Rate	0.39
w50: m³/h/m² Floor Area	1.13
q50:	

Leakage Areas: 55.0 cm² (+/- 21.7 %) Canadian EqLA @ 10 Pa
30.0 cm² (+/- 34.6 %) LBL ELA @ 4 Pa

Building Leakage Curve: Air Flow Coefficient (Cenv) = 11.8 m³/h/Paⁿ (+/- 54.1 %)
Air Leakage Coefficient (CL) = 11.7 m³/h/Paⁿ (+/- 54.1 %)
Exponent (n) = 0.623 (+/- 0.141)
Correlation Coefficient = 0.97514

Test Standard: EN 13829
Test Mode: Pressurization
Type of Test Method: A
Regulation complied with: EN13289 n50 ≤ 0.6 1/h



7.1 Ventilation

The ventilation system is a Zehnder ComfoAir 350, with a Comfotube flat51 flexi-duct system.

Effective heat recovery: 82.6%
Electrical efficiency: 0.29 Wh/m3
Ventilation rates/values: (below)

FANTECH

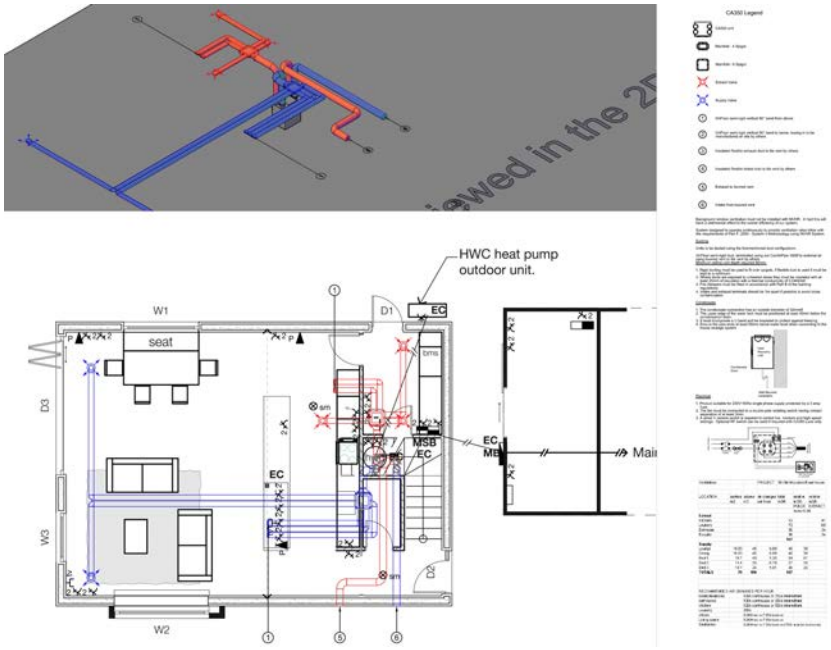
AIR FLOW RATES

Customer name	Brooke Cholmondeley-Smith
Project name	39, Old Mountian Road House
Sales person	Luc Jorieux
Date of Quote	27.01.12

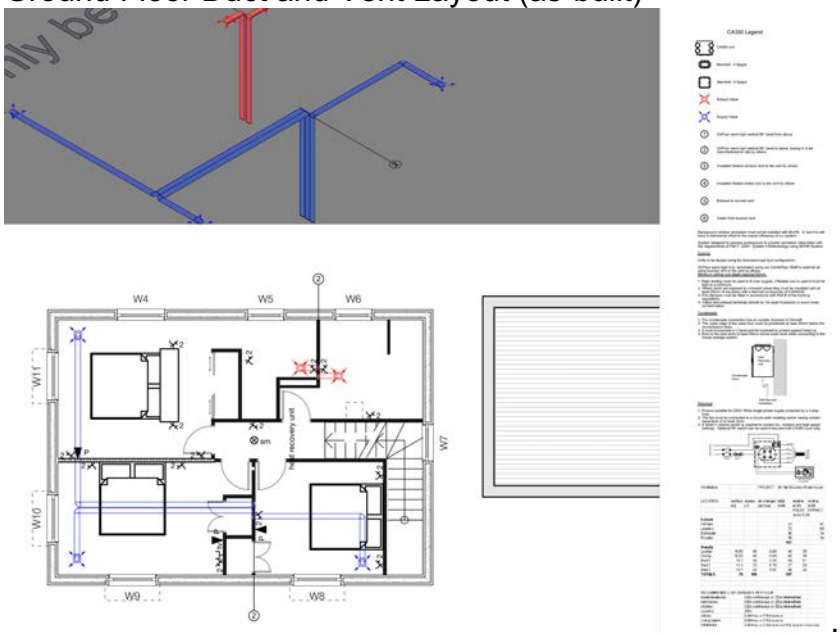
Designation	Surface m^2	Height	Volume m^3	Extract M^3/ Hr
Kitchen	14.00	2.7	38	43.00
Laundry	5.71	2.7	15	72.00
Bathroom	9.51	2.55	24	36.00
Ensuite	5.12	2.55	13	36.00
Lounge	16.63	2.7	45	
Dining	18.63	2.7	50	
Master Bed	18.70	2.55	48	
Bed 2	14.40	2.55	37	
Bed 3	10.70	2.55	27	
				187.00

7.2 Ventilation Layout

The HRVU unit is positioned in the laundry on the ground floor. The ducts are distributed in the timber framed mid-floor and roof trusses. All ducts are inside the thermal envelope. Zehnder filters and outlets are used. The system was commissioned and balanced by the New Zealand Zehnder supplier and installer (Fantech NZ). There is a supply vents to each bedroom and two in the living area (shown below on drawings in blue). The extract vents are positioned in the kitchen, WC, laundry, bathroom and ensuite (shown below on drawings in red).



Ground Floor Duct and Vent Layout (as-built)



First Floor Duct and Vent Layout (as-built)

Ventilation ducts installed in the first floor ceiling

8.0 Heat supply

The additional heating demand is provided by an electric heater. This heating source is a manually operated unit that the occupants plug into the house and use as required throughout the year. The unit has a 2kw output

Main and only heating source in project

9.0 PHPP results

Year built:	2012
Treated floor area:	124.7m2
Enclosed volume:	479.2m3
Specific space heating demand:	4kWh/(m2a)
Heating load:	5W/m2
Pressurisation test result:	0.42h-1
Specific primary energy demand:	89kWh/(m2a)

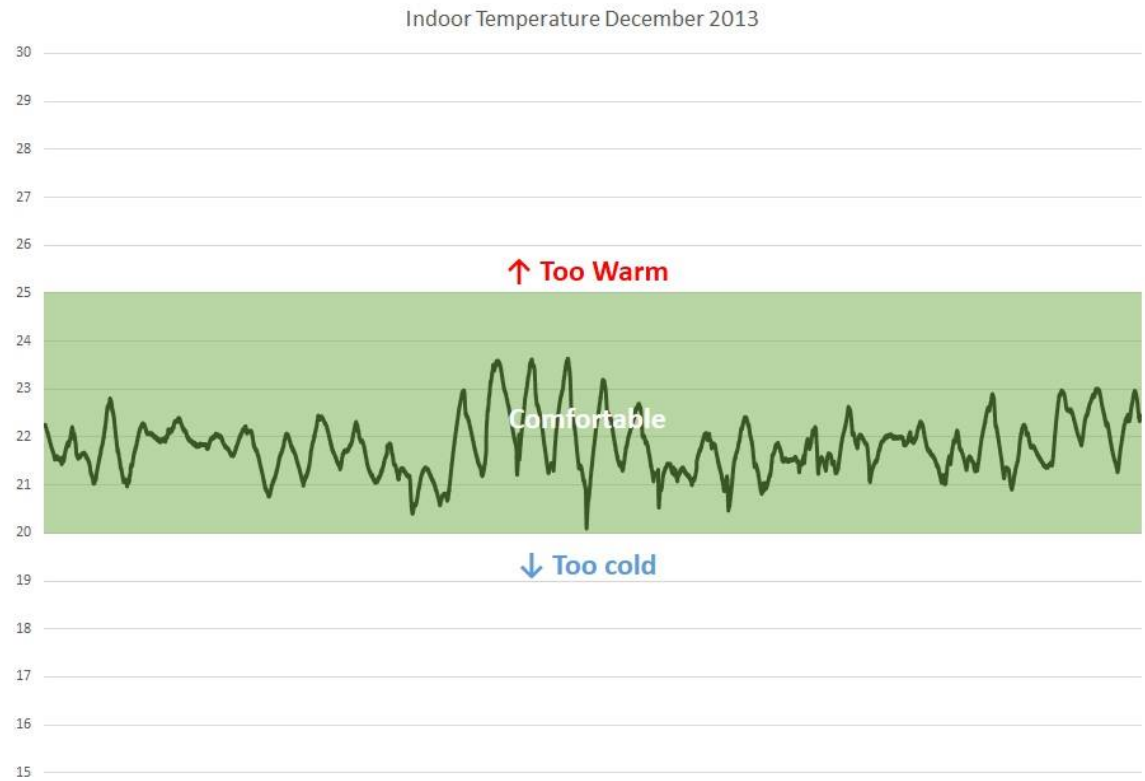
Specific primary energy demand (DHW, heating, auxiliary electricity):	50kWh/(m2a)
Specific primary energy reduction through solar electricity:	0kWh/(m2a) (not used)
Frequency of overheating:	5% (over 25c)
Cooling load:	9W/m2

10.1 Construction costs

The completed construction house was $384,000.00NZD. Equating to a cost is $2,455/m2 for the house.

11 User assessment

The owner of the project has installed a temperature monitoring system. This system collects data samples multiple times during the day and night. There are several zones it collects from internally and externally. The house has been monitored since its completion and the client is very pleased with the performance of the house.



There is a temperature monitoring system installed in the house.

12 Reference publications

- https://www.facebook.com/passivehousenz/
- http://www.raglan23.co.nz/2012/passive-house-to-be-built-in-raglan/
- http://www.stuff.co.nz/waikato-times/news/7389945/Passive-approach-reaps-home-benefits-for-Waikato
- https://www.youtube.com/watch?v=jRJh9vxzfWQ