Passive House - Project Documentation

Double attached family house, Coatesville, Auckland, NZ
(Passive House database **4719**)

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The Coatesville eHaus project commenced on site in May 2014 and was completed in December 2015 and achieving certification in December 2015.

The client brief was two connected French style homes suitable for 3 generations of the same family. It is situated in a rural spacious subdivision the rolling hills of Coatesville, north of Auckland.

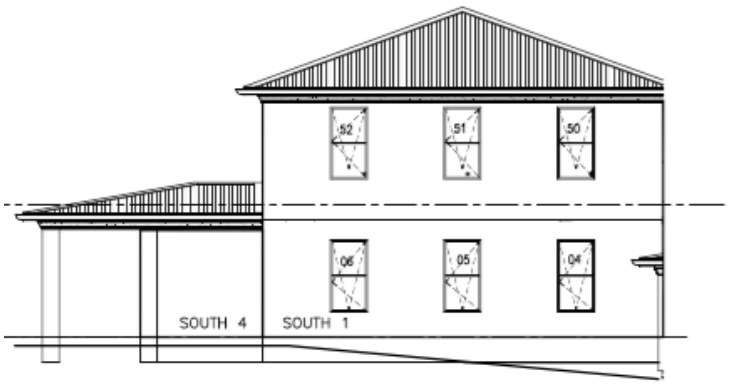
Key features: ICF wall construction, uPVC frames with external electrically operated shading, 112,500 litre water harvesting storage system for potable water, 50,000 litre water harvesting storage for irrigation, 6.75kW solar PV system. 2 Solar hot water systems (3.7m²)with 300 litre storage tanks.

U-Value of the exterior walls:	0.267 W/(m²K)	PHPP Space heating demand: 7kWh/(m²a)
U-Value of the floor slab:	0.184 W/(m²K)	PHPP Primary energy: 100kWh/(m²a)
U-Value of the roof:	0.154 W/(m²K)	Pressurisation test n_{50} : 0.28/h^{-1}
U-Value of the window frame:	1.40 W/(m²K)	Heat recovery efficiency: 78%
U-Value of the glazing:	1.10 W/(m²K)	

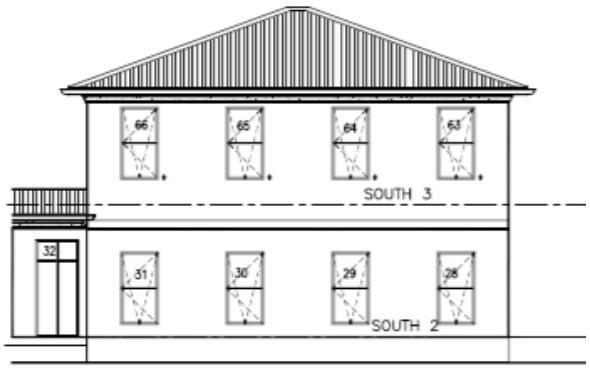
2.2 Short Description of the construction:

This two level double family home was built in 2014-2015. 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. An ICF system has been used for the wall structure with a flexible plaster system proving the weather tightness and exterior finish. The glazed element represents 18% of the wall area which assists with maintaining a cool internal temperature in the summer in this warm temperate southern hemisphere climate. Coupled with this is the minimisation of glazing to the West. The combined treated floor area is 367m²and the calculations for the PHPP and air tightness 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. The modest sized windows frame views of the rural rolling hills that surround the property.

2.3 Elevations:



SOUTH ELEVATION



SOUTH ELEVATION

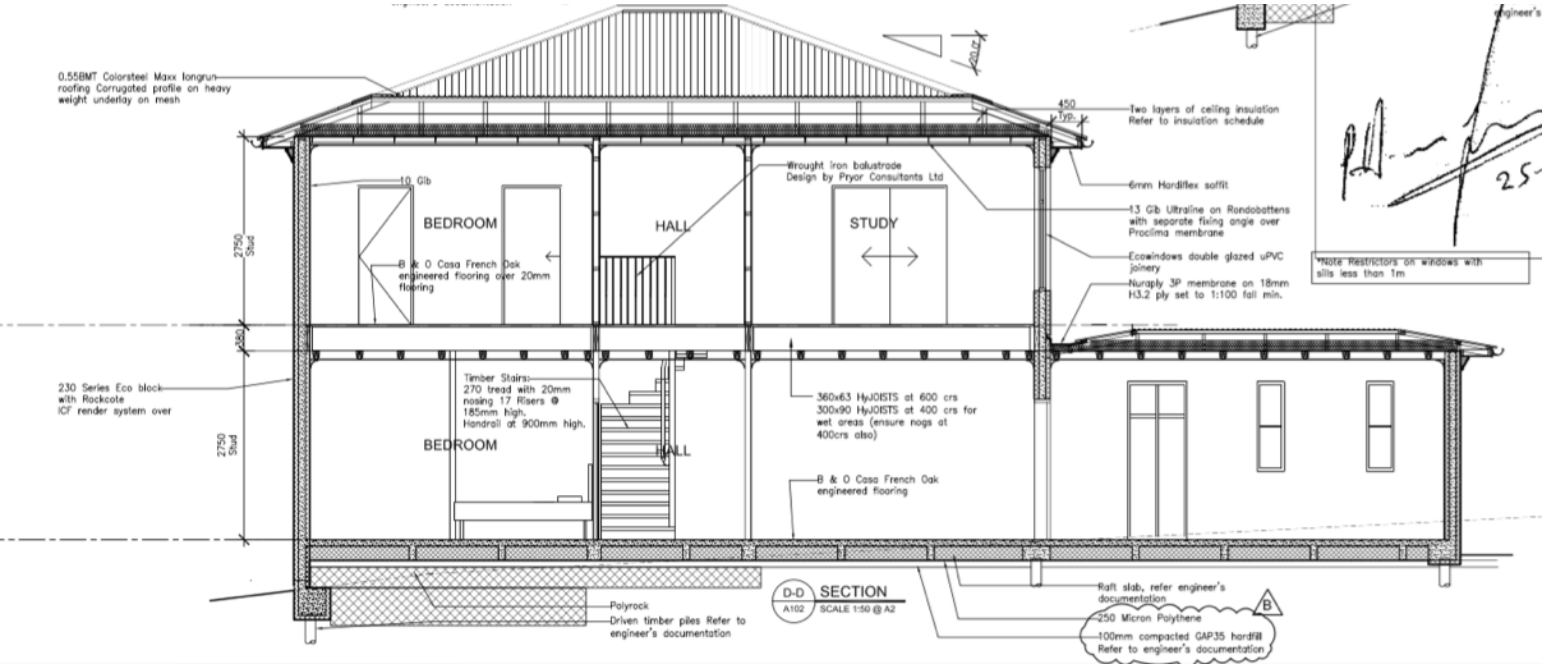
NORTH ELEVATION

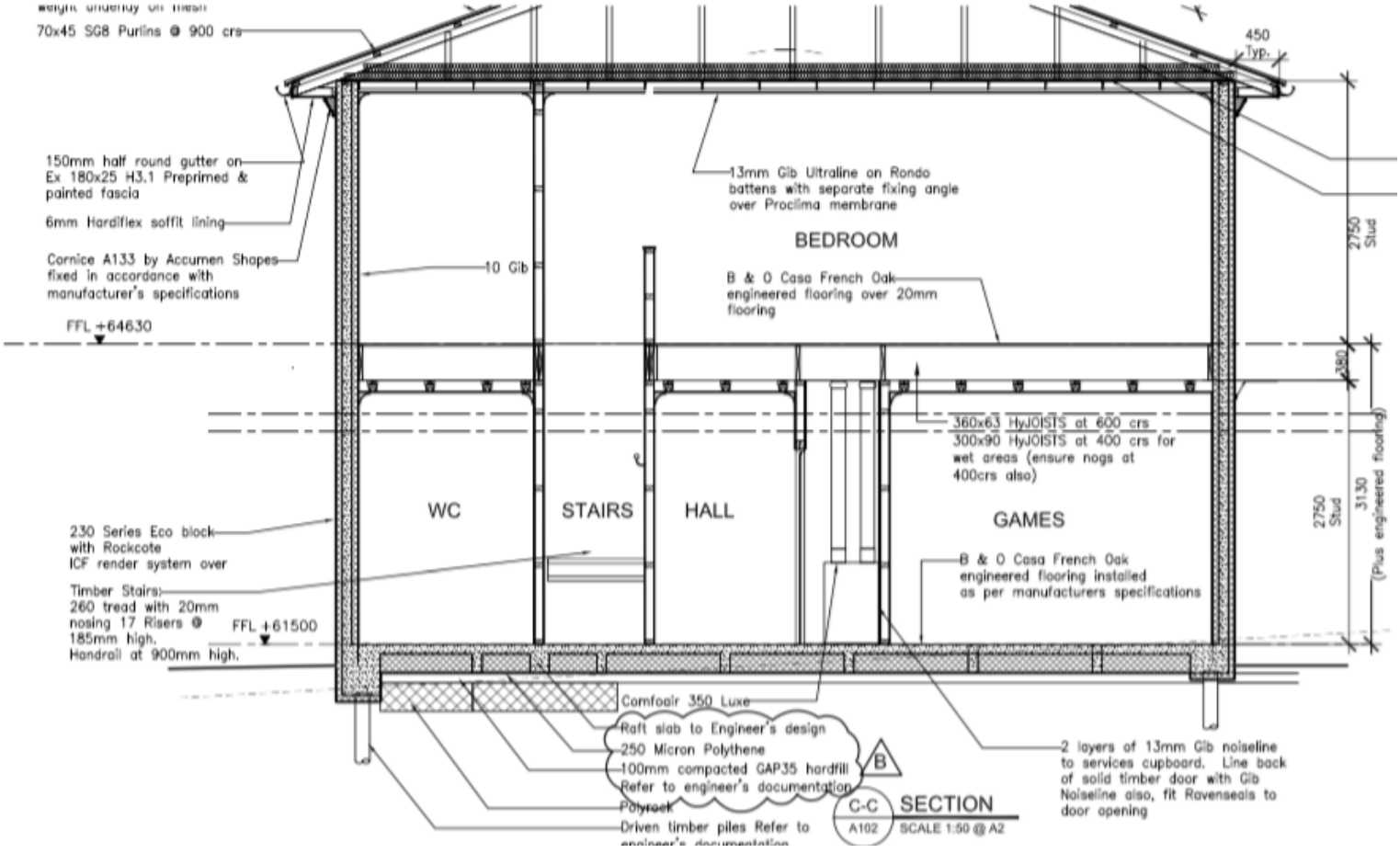
EAST ELEVATION

WEST ELEVATION

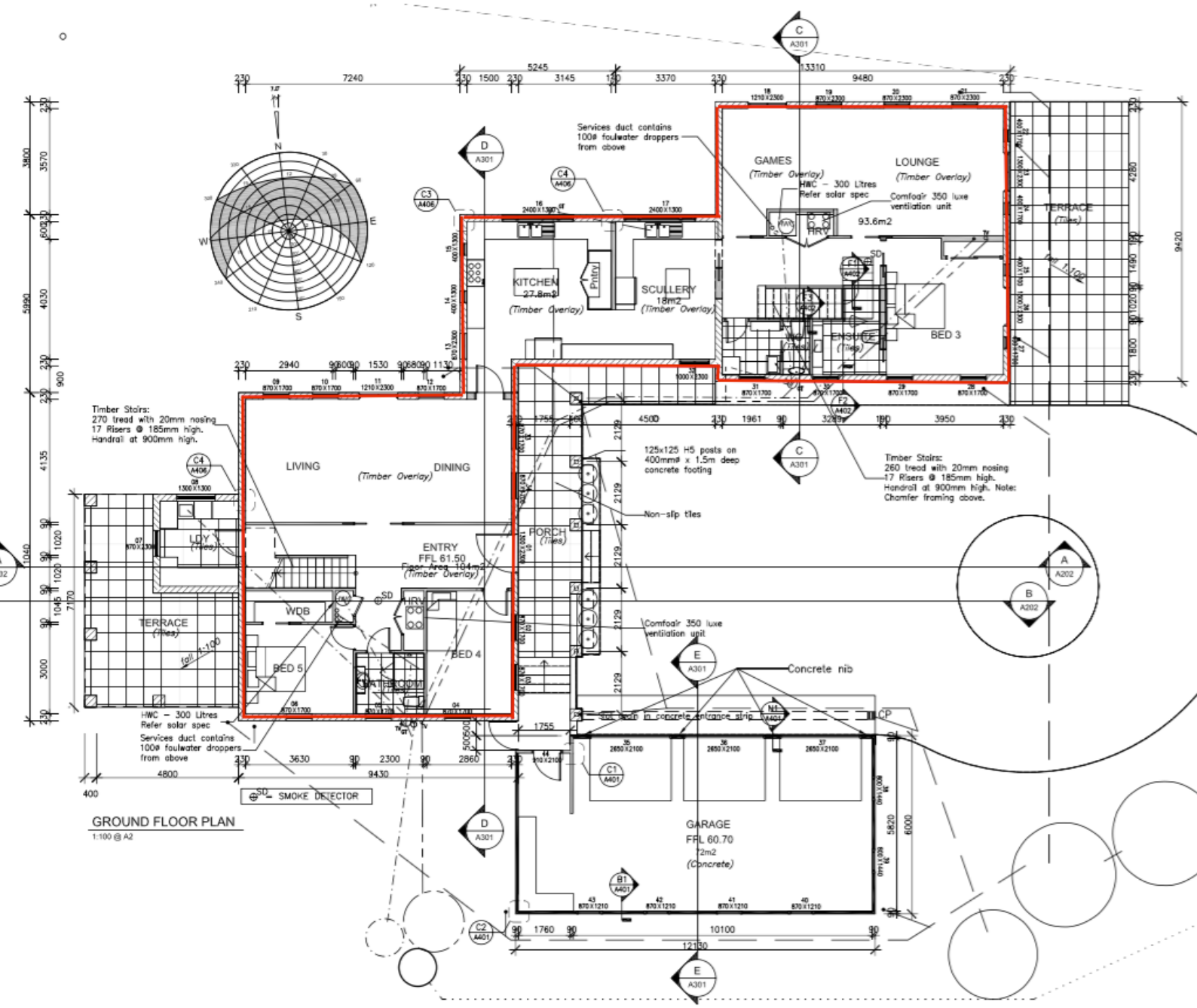
2.4 Internal pictures:

2.5 Cross section:



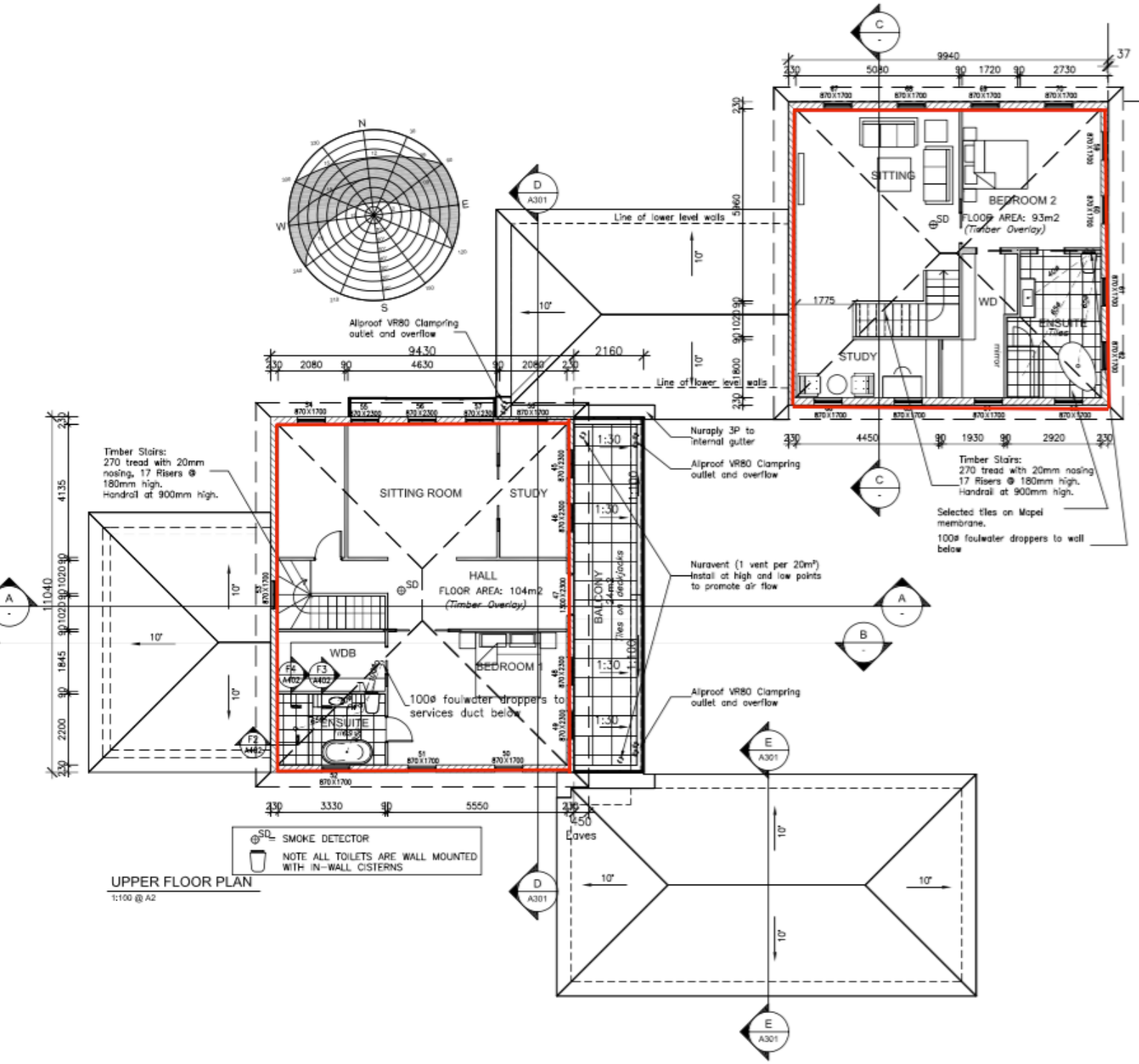


2.6 Floor Plans:



Ground floor with Treated Floor Area marked

Upper floor with Treated Floor Area marked



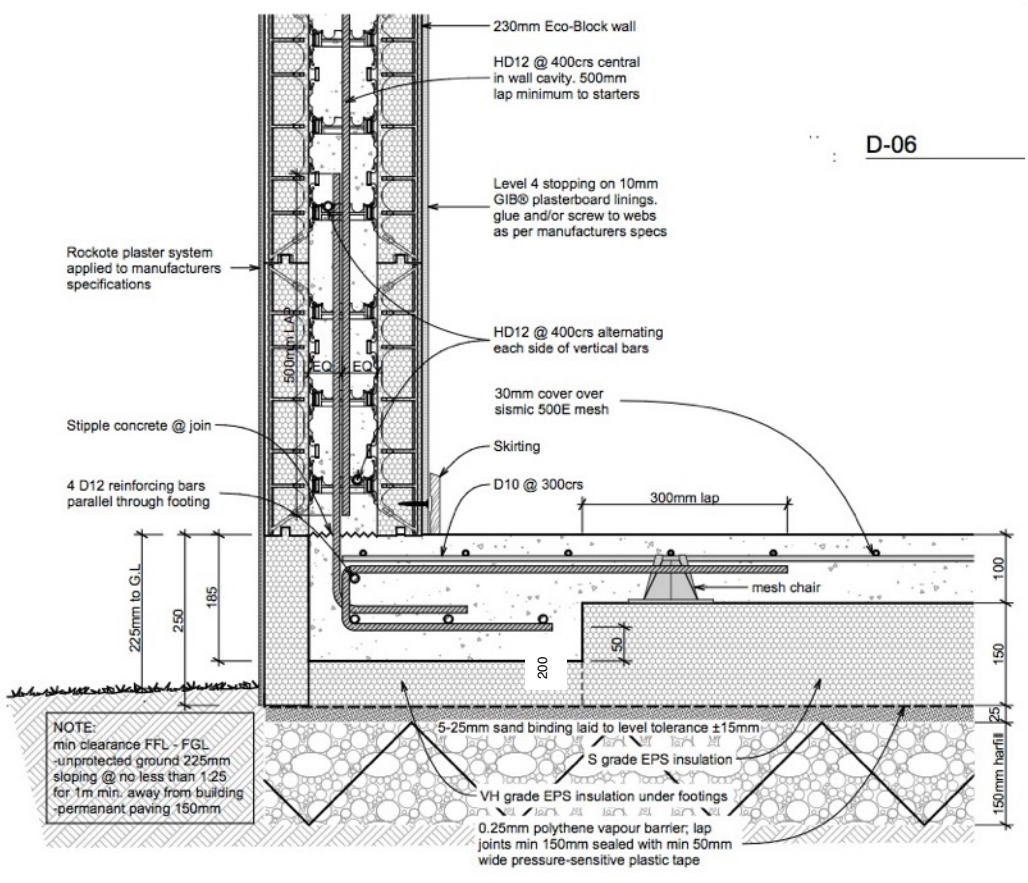
2.7 Construction details:

2.7.1 Footing and Slab

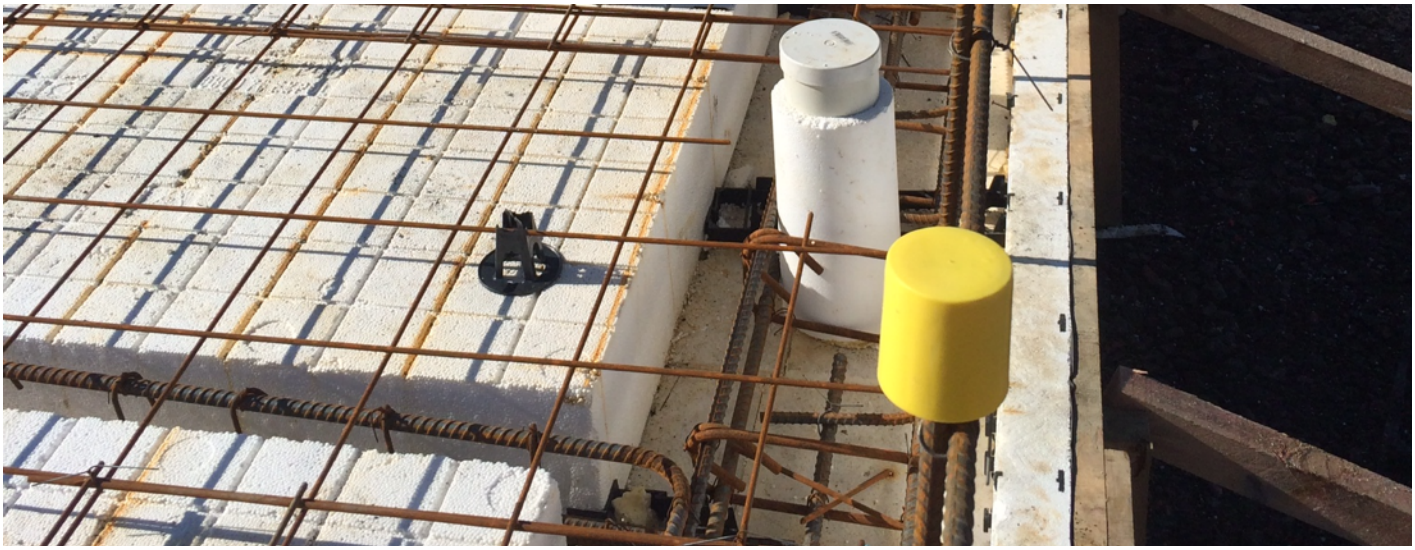
EPS(038) 200mm
DPC 1mm
Reinforced concrete 100mm

} U-Value = 0.184W/

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 ICF block used for the walls.



D-01 TYPICAL FOOTING 1:10

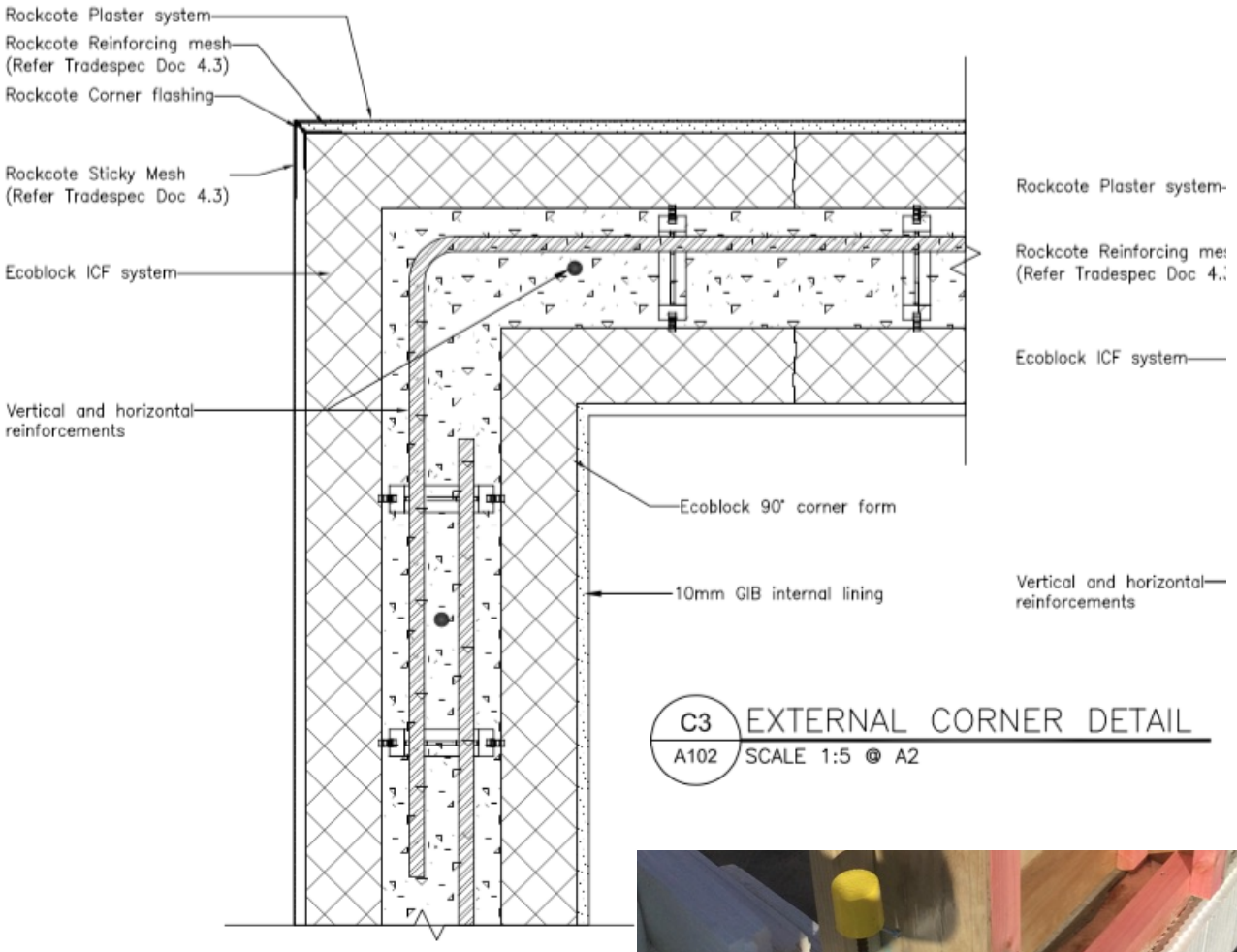


2.7.2 Exterior Walls

EPS(037)65mm
Rockcote Plaster System
Reinforced concrete 100mm
EPS(037) 65mm
Plaster Board 10mm

} U-Value = 0.261W/(m²K)

The exterior walls are made of Insulated concrete forms (ICF) and have a U-value of 0.261W/(m²K). This is a simple and effective method for developing a continues insulation layer and this particular configuration is suitable for the warm temperate climate conditions that are found in this region of New Zealand. The concrete layer also offers thermal inertia and air tightness.



2.7.3 Intersection Wall/Floor

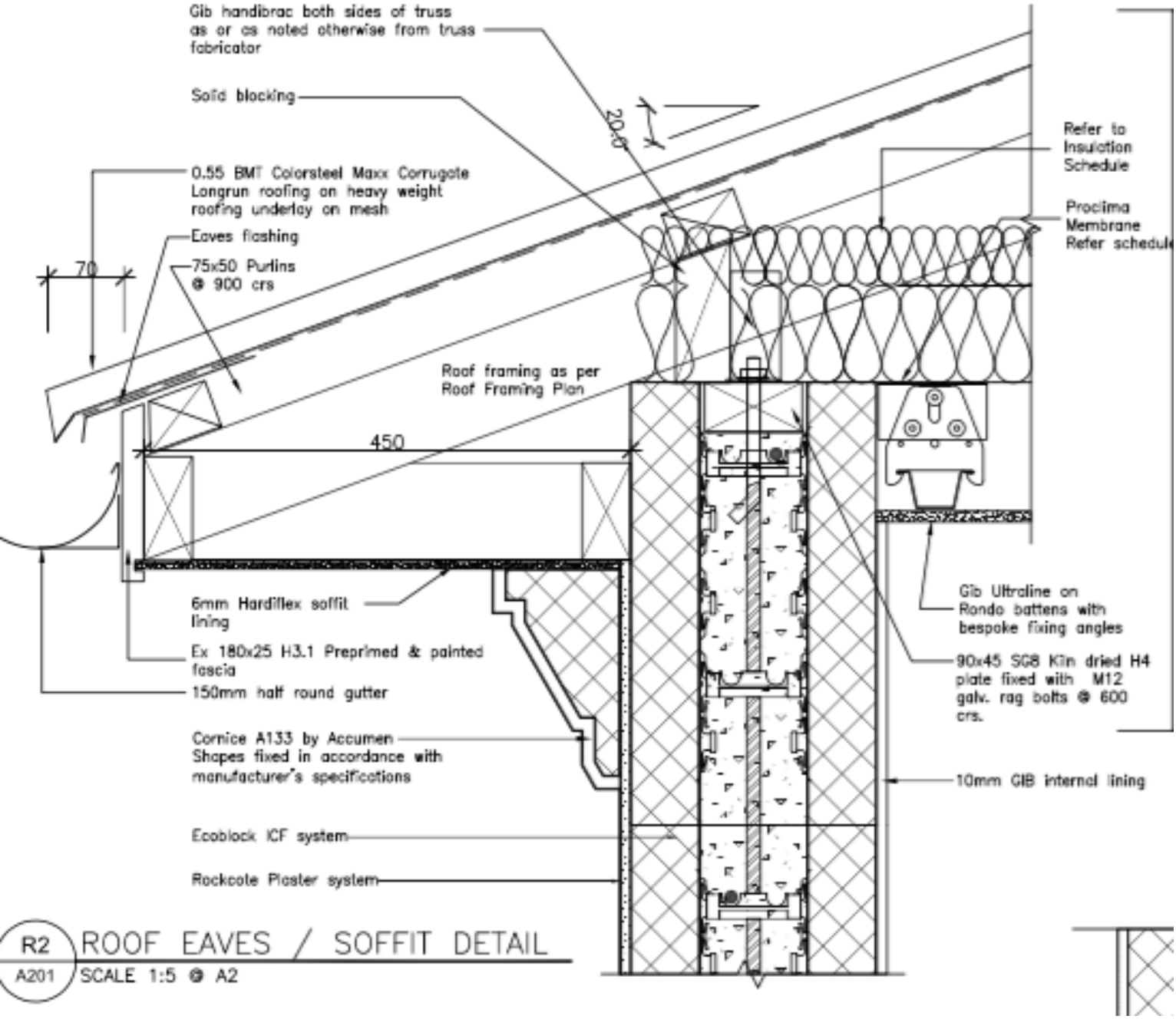
This photo shows the junction between the first floor and the exterior walls. There are no thermal bridges as the fixings are all inside the thermal envelope of the structure.

2.7.4 Insulation of the Roof

Steel tray roofing 0.55mm
Fibreglass layer 1 130mm (0.4)
Fibreglass layer 2 130mm (0.4)
Air tight membrane 1mm
Rondo battens 35mm
Plaster Board 13mm

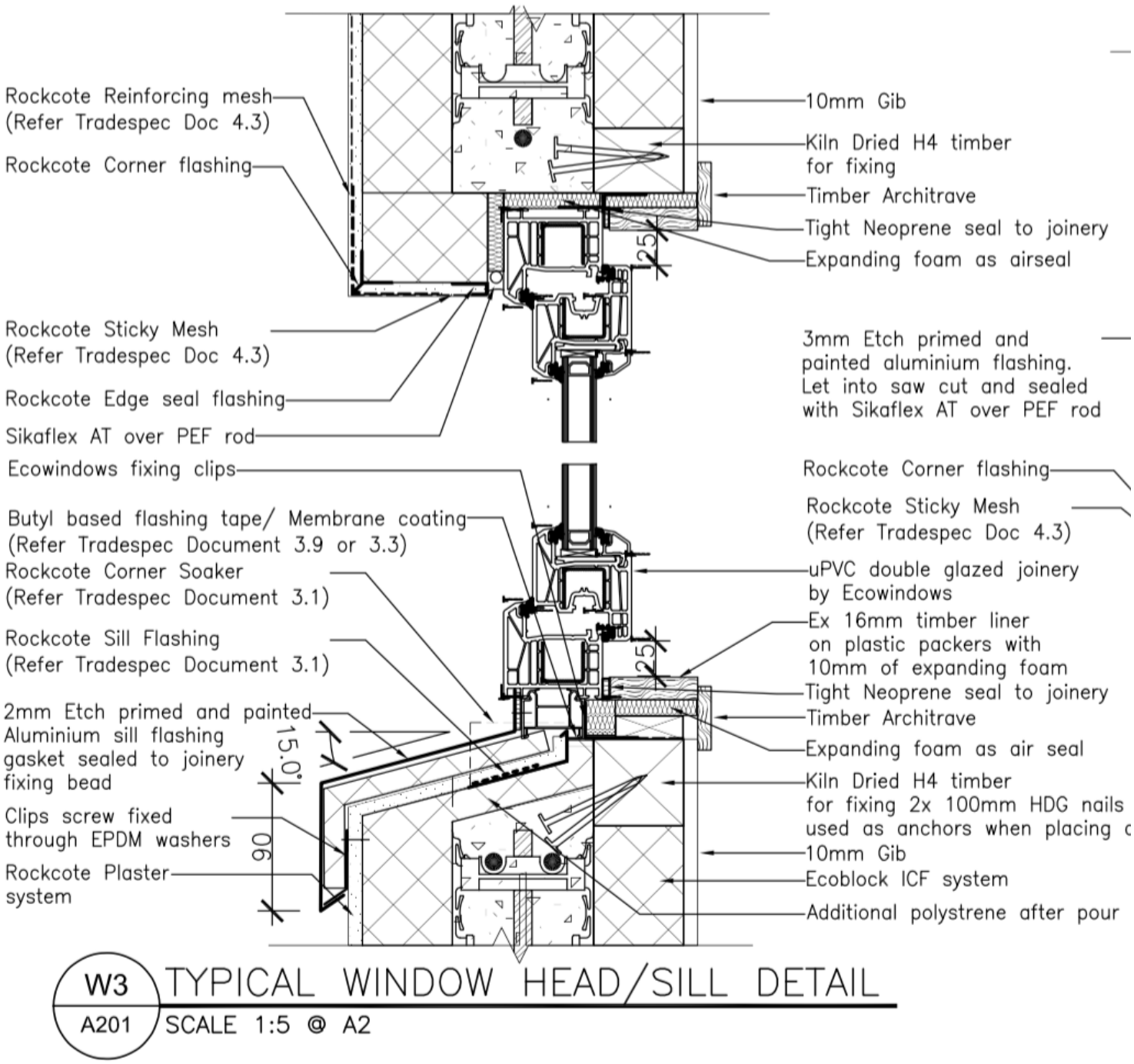
} U-Value = 0.154W/(m²K)

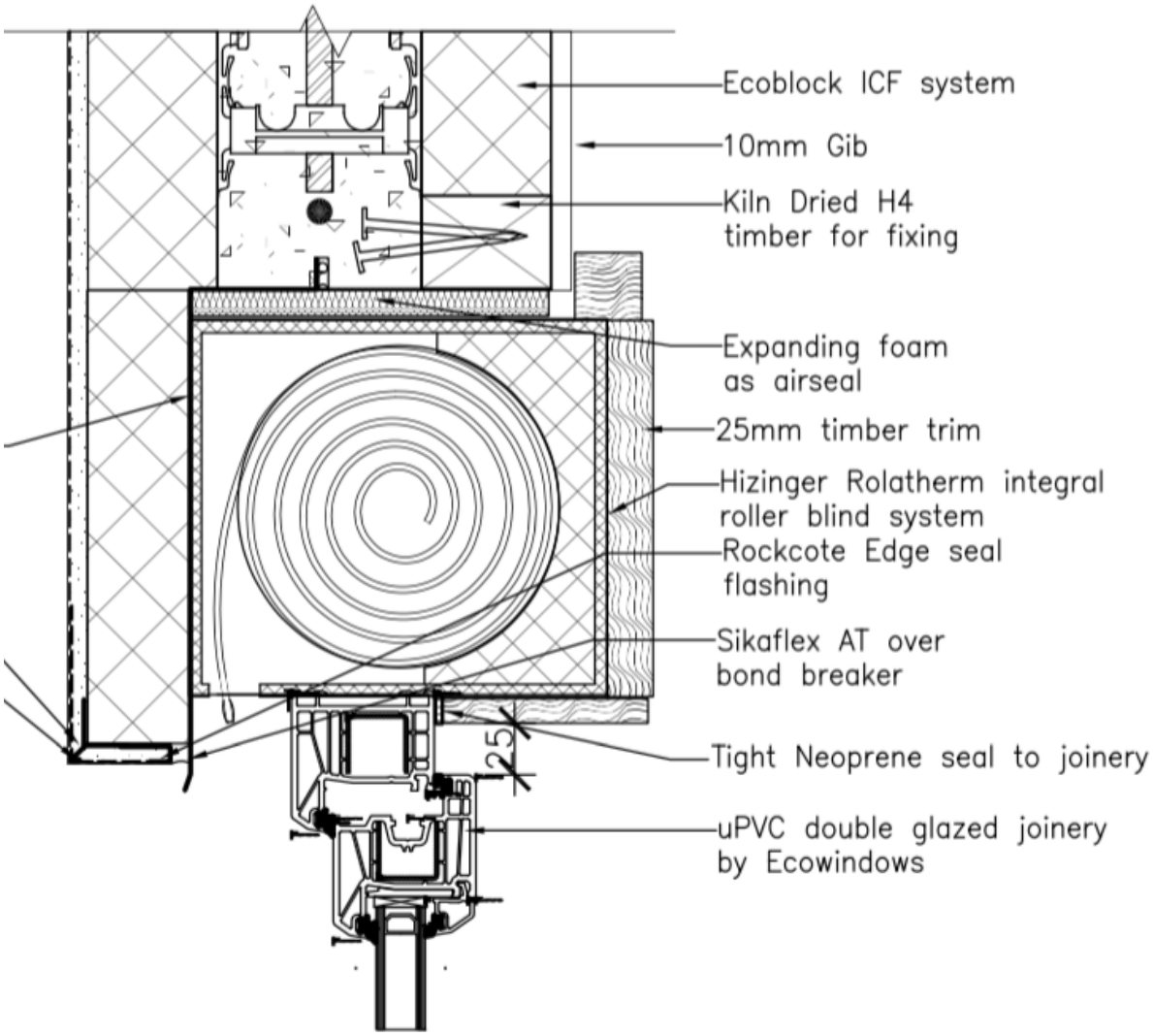
The U value of the roof of 0.154 W/(m²K) was achieved using two layers of fibreglass insulation.



2.7.5 Window installation details

To achieve the passive house standard the windows were imported from German company Hilzinger. The product used was Prestige uPVC. A number of the windows were fitted with the Rolatherm integrated blind system predominately on the west facing glazing. (Uf-value 1.4 W/(m²K)) The glazing was also imported from Germany and was Isolar Neutralux advance 4-16-4 Low E Argon Double glazing (Ug-value 1.1 W/(m²K), g-value 62%). Eco windows is the New Zealand company that import and distribute these windows.

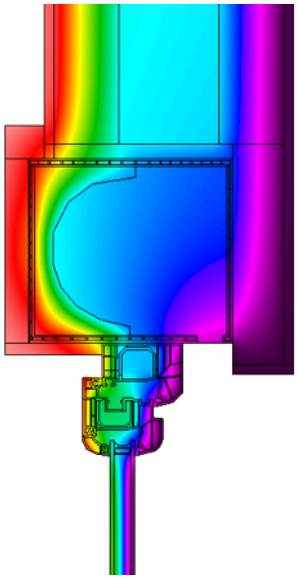




ROLLER SHUTTERS

concrete W3a WINDOW HEAD DETAIL

A201 SCALE 1:5 @ A2

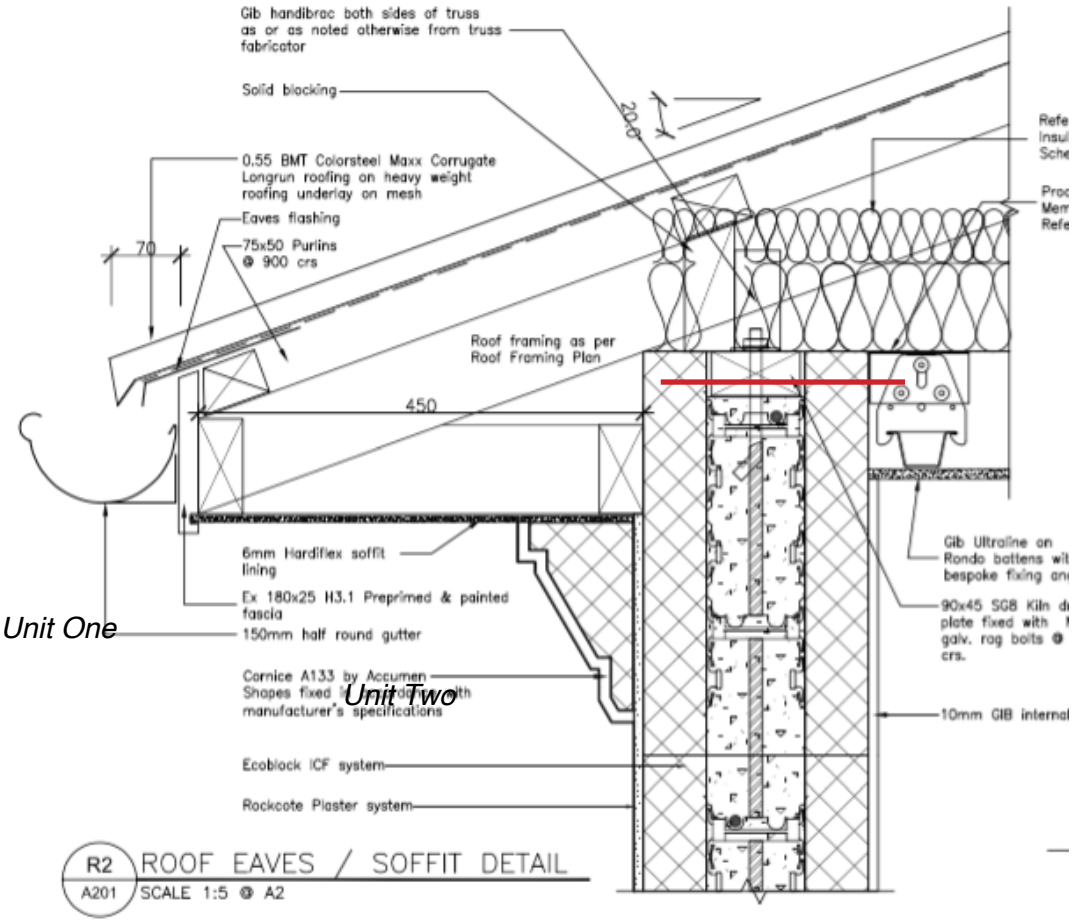


Thermal image of window roller shutter assembly using Therm

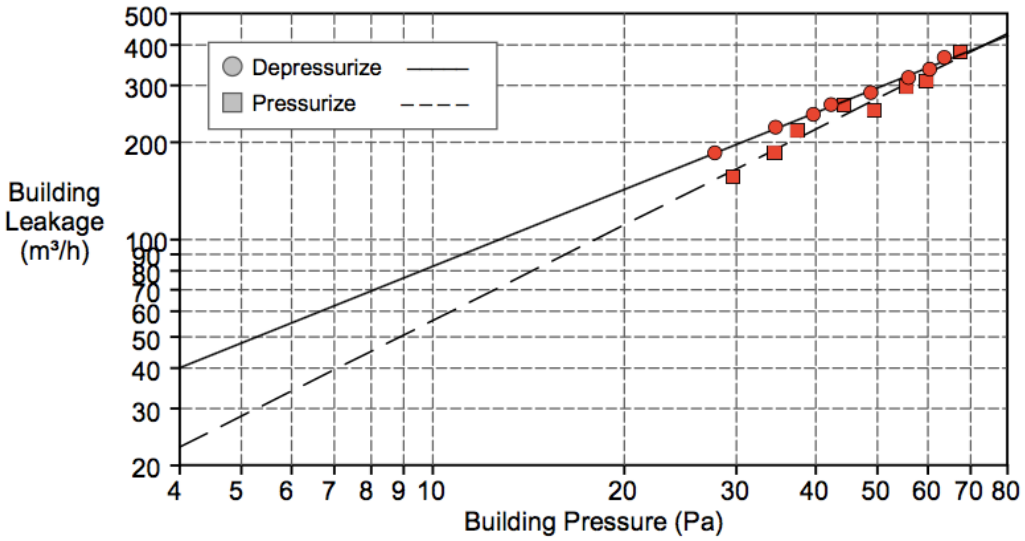
2.7.6 Air tightness and pressure test documentation

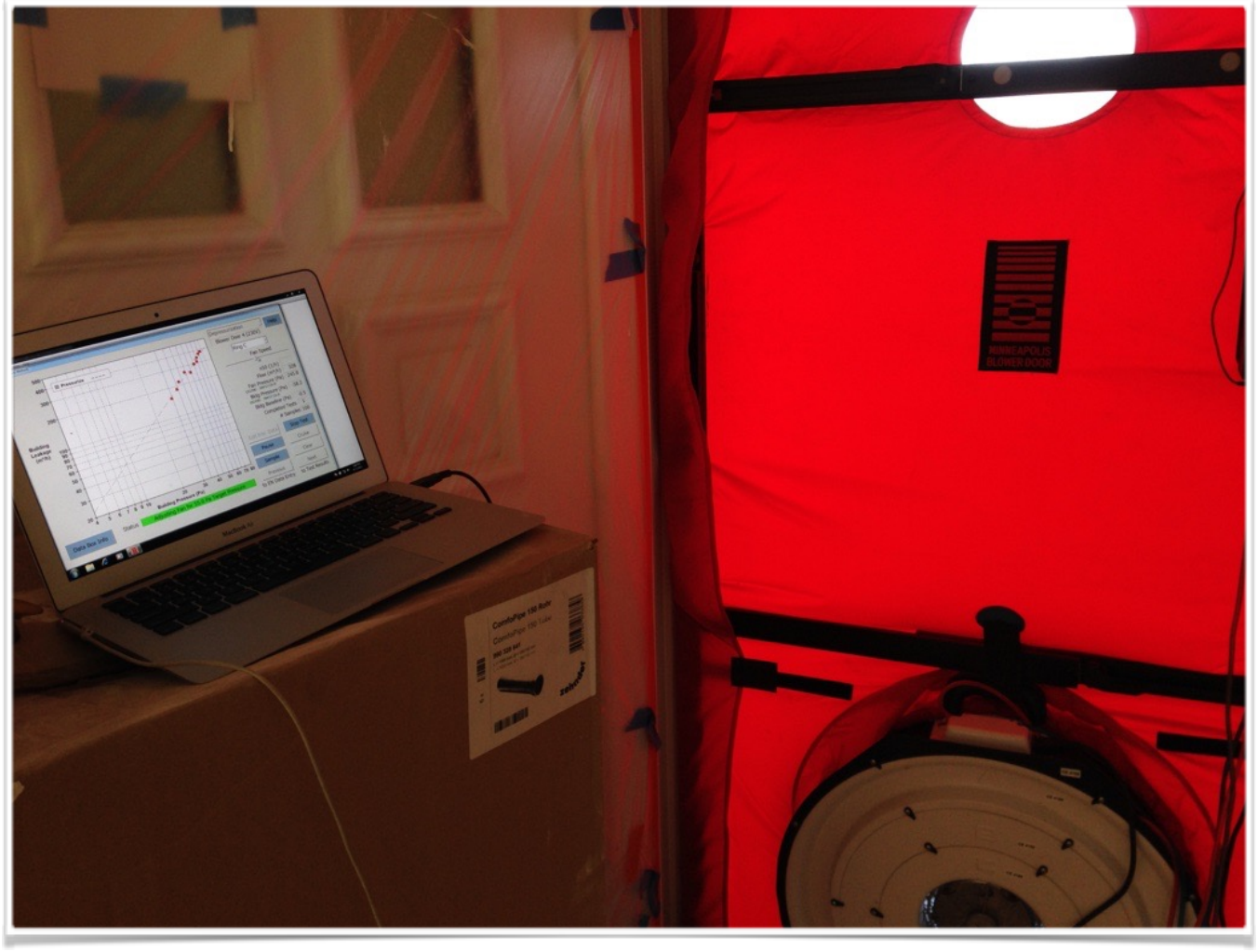
Using a concrete pad foundation and an ICF wall structure simplifies the air tightness designation for this building. The roof wall junction air tightness was achieved with an air tightness membrane (proclima intello). The tapes and sealant was also used for the window installation.

Air Tightness detail



Result of the Air Tightness Test

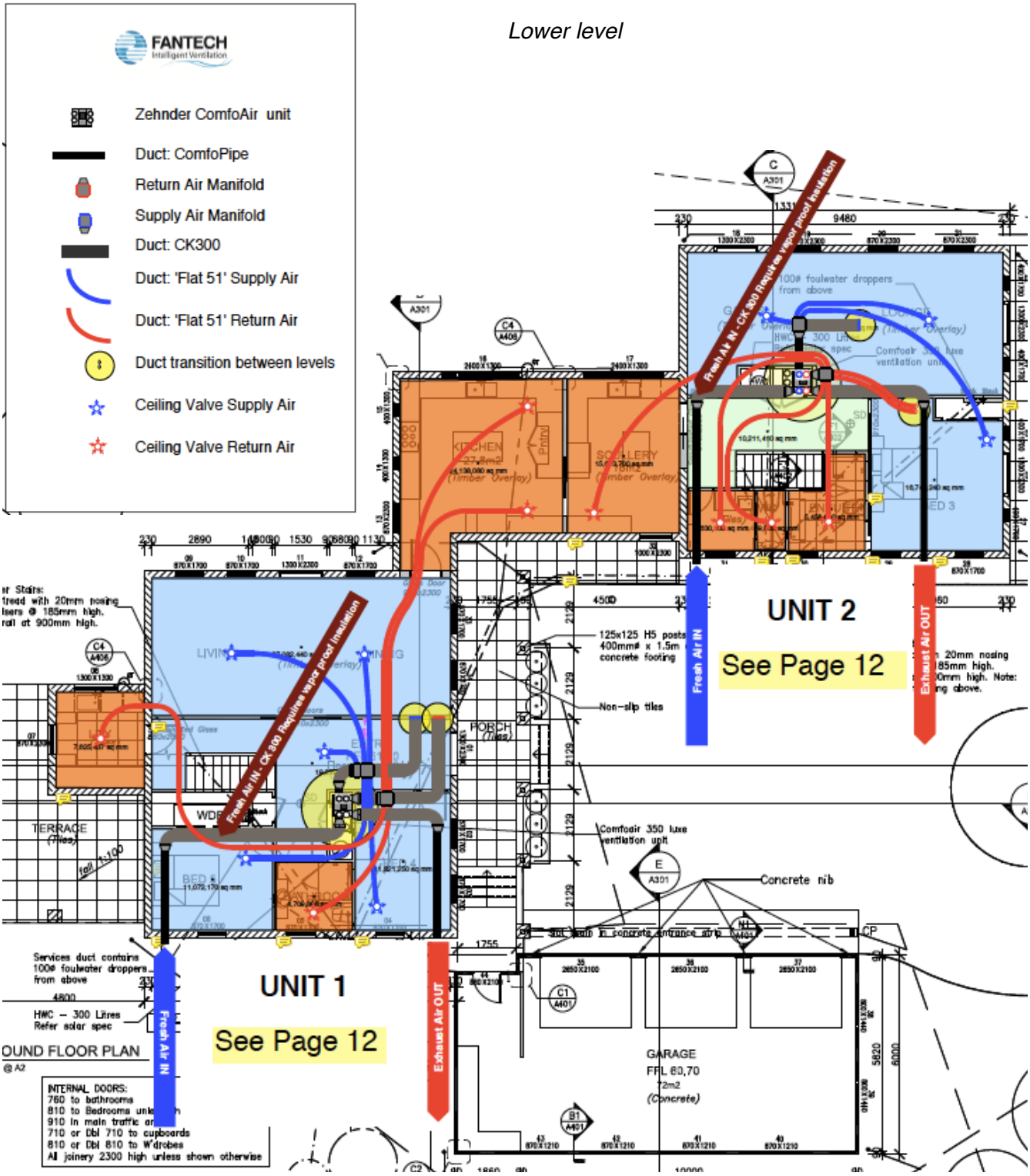



MINNEAPOLIS
BLOWER DOOR

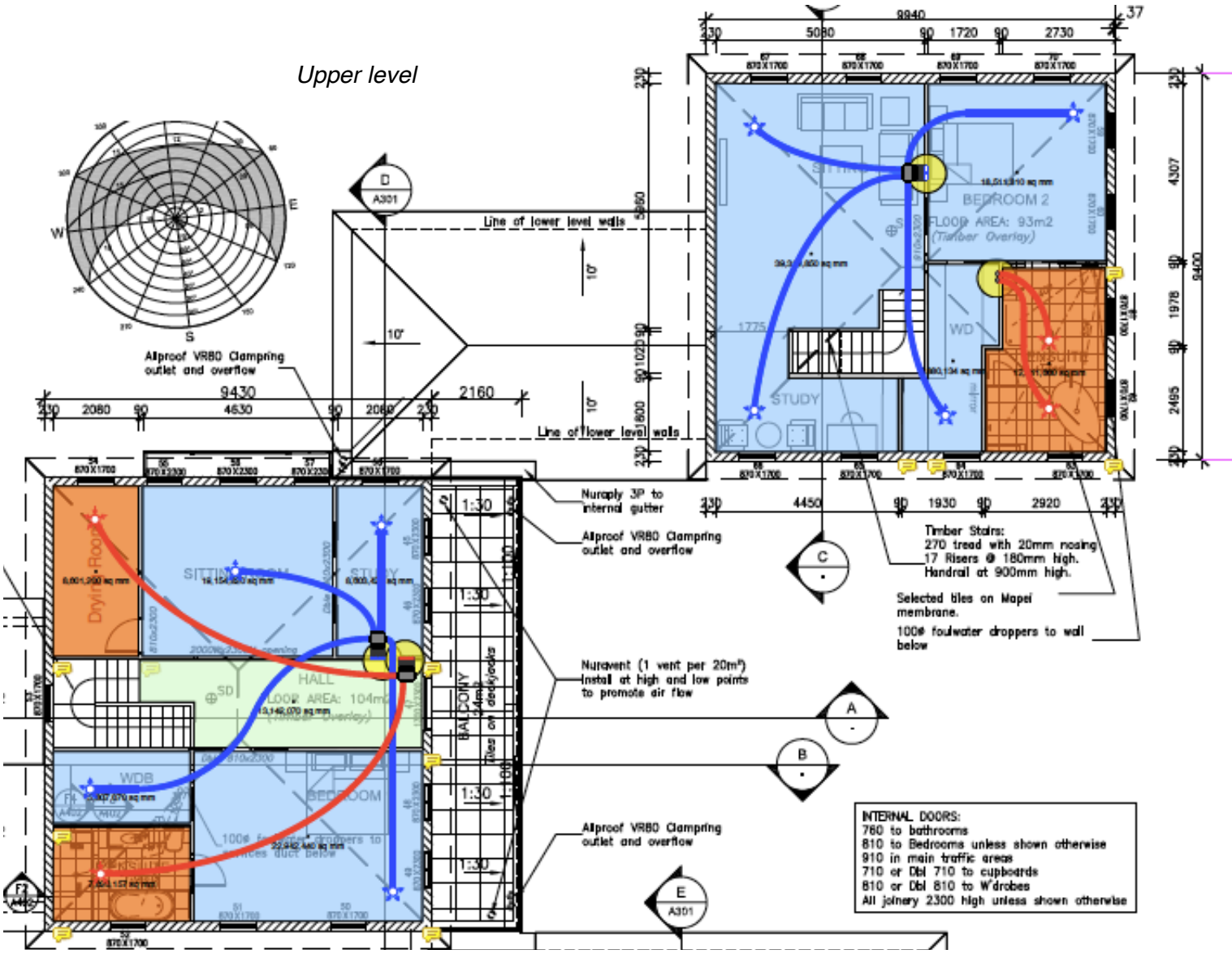

INTELLO®
47
48

2.7.7 Ventilation unit and system design

There are two mechanical heat recovery ventilation units used for this project. The Zehnder comfo air 350 units with a heat recovery coefficient of 78% and a power consumption at 100Pa of 0.29Wh/m³.Each unit is located in ground floor service cupboard along with the hot water storage. Also fitted to both units is an additional pollen filter box at the clients request.



Upper level



Unit One

Unit Two

2.7.8 Heat Supply

The heating requirement is supplied with two electric heaters situated in the main living areas and heated town rails in the main bathrooms. The hot water is provided with a solar thermal flat panel system with two 300 litre tanks in each of the dwellings.

2.8 PHPP results

The excellent space heating result is due in part to the ICF wall system which provides a good specific capacity and also the favourable climate conditions. The air tightness result of 0.27ACHn50 also assists this result.

Over heating was minimised with external electrically operated shading on much of the western glazing. The combination of this and many openable windows has ensured that any tendency to overheat has been minimised.

The homes have been designed to be low maintenance solid construction, all materials have been selected for aesthetic appeal and longevity. The Sto plaster system is has a light colour finish to minimise fading and maintenance is reduced to washing once a year to remove dust. eHaus worked early in the design stage with the PHPP to ensure the design criteria was working from a performance perspective. CADViz were employed to complete the design work and a high level of communication between all involved worked to ensure that the finished result worked extremely well.

A grid tied 6.75kW solar PV system was fitted to provide supplementary power to both households through a mains terminal located in the garages. This was added after the PHPP work and certification had been completed and so is not captured in the energy modelling report.

2.09 Year of construction and costs

The construction period was over a 18month period with final landscaping still in process. But the family moved into the home in October 2015. The final cost is not know as the client managed the project and subcontractors. Typically the ICF building system with two level homes equate to $3,000- $3,500 m².

2.8 Experiences

Since moving in the owners have been very happy with the home. When interviewed recently the owner said when asked what is it like living in an eHaus *"Its great, its extremely comfortable and a very elegant form of living. You don't notice temperature differences..... its an incredible way to live. Everyone that visits the house including builders have noticed it as well. It is many many times better than anything they have experienced before. The entire bill in at the peak of winter for each house is less than $100"*

Passive House verification

Building:	New Residence		
Street:	119 Screen Road		
Postcode / City:	Coatsville		
Country:	New Zealand		
Building type:	Residential		
Climate:	[NZ] - Auckland	Altitude of building site (in [m] above sea level):	60
Home owner / Client:	J Bullar/H Kler		
Street:	119 Screen Road		
Postcode/City:	Coatesville, Auckland		
Architecture:	eHaus & CADVIZ		
Street:	Unit 5a 80 Paul Matthews Road, Rosedale		
Postcode / City:	P.O Box 33617, Takapuna Auckland		
Mechanical system:	eHaus		
Street:	120 Blueskin rd		
Postcode / City:	4571, Wanganui		

Year of construction:	2014-2015		Interior temperature winter:	20.0	°C	Enclosed volume V_e m³: 1387.6
No. of dwelling units:	2		Interior temperature summer:	25.0	°C	Mechanical cooling:
No. of occupants:	10.5		Internal heat sources winter:	2.1	W/m²	
Spec. capacity:	204	Wh/K per m² TFA	Ditto summer:	2.6	W/m²	

Specific building demands with reference to the treated floor area

				Requirements	Fulfilled?*
	Treated floor area	367.0	m²		
Space heating	Heating demand	**7**	**kWh/(m²a)**	15 kWh/(m²a)	yes
	Heating load	**8**	**W/m²**	10 W/m²	yes
Space cooling	Overall specif. space cooling demand		**kWh/(m²a)**	-	-
	Cooling load		**W/m²**	-	-
	Frequency of overheating (> 25 °C)	5.8	%	-	-
Primary energy	Heating, cooling, dehumidification, DHW, auxiliary electricity, lighting, electrical appliances	**100**	**kWh/(m²a)**	120 kWh/(m²a)	yes
	DHW, space heating and auxiliary electricity	49	kWh/(m²a)	-	-
	Specific primary energy reduction through solar electricity		kWh/(m²a)	-	-
Airtightness	Pressurization test result n_{50}	**0.3**	**1/h**	0.6 1/h	yes

* empty field: data missing; '-': no requirement

Passive House?	**yes**

We 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 application.

Name:	Jon
Surname:	Iliffe
Company:	ecoBuild Developments

PHPP Version 8.4

Registration number PHPP:	PHIDE_030913_24787452_en8
Issued on:	16/11/2013
Signature:	Jon Iliffe