

Project Documentation

FINCH RESIDENCE



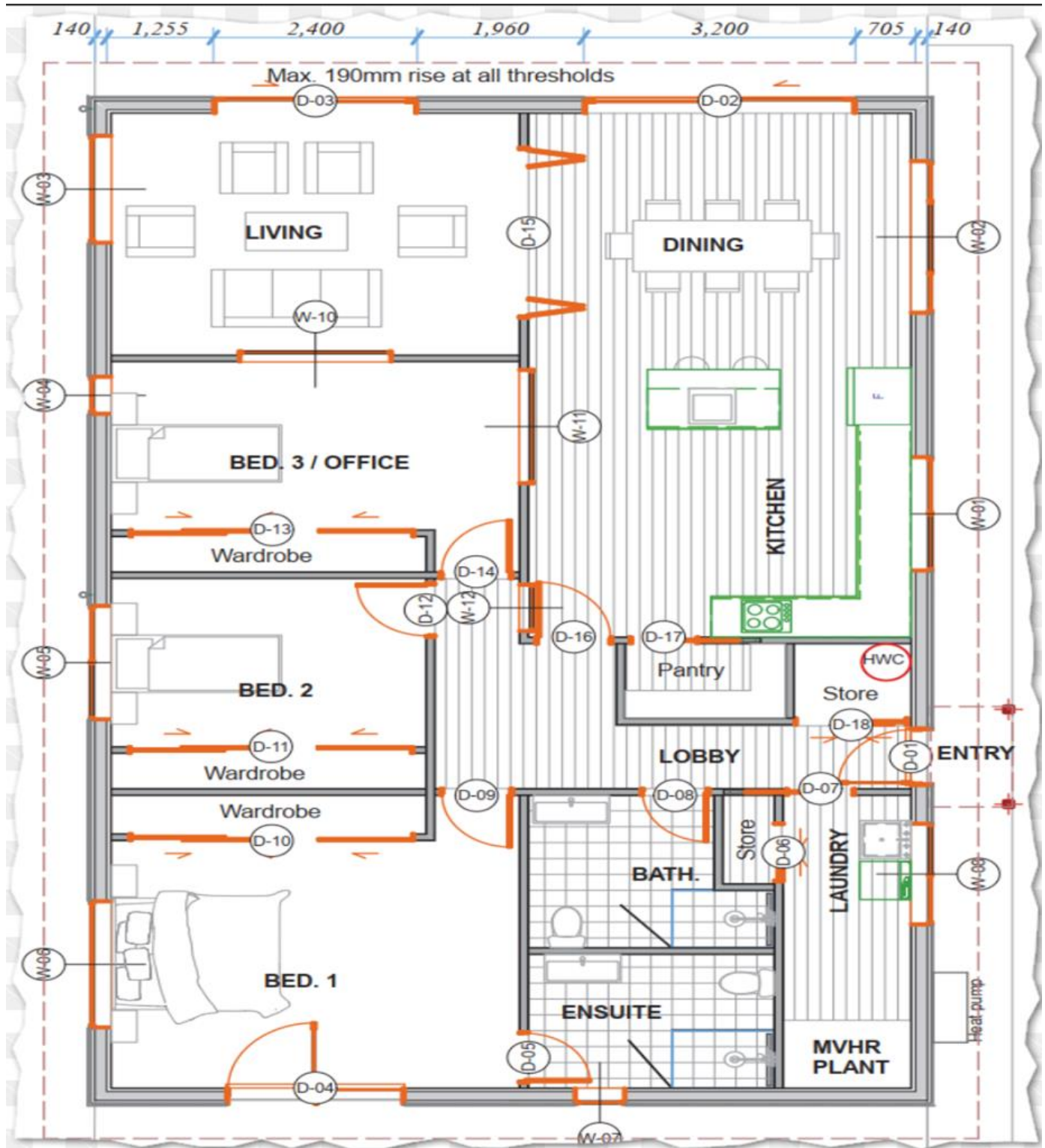
New single-storey, mono-pitch detached house, timber frame construction, suspended timber floor with SureFoot substructure in Waikuku Beach, North Canterbury, New Zealand

Data of building			
Year of construction	2023	Space heating requirement	12 kWh/(m²a)
U-value external wall	0,208 W/(m ² K)		
U-value floor	0,180 W/(m ² K)	Primary Energy Renewable (PER)	27 kWh/(m ² a)
U-value roof	0,128 W/(m ² K)	Generation of renewable Energy	- kWh/(m ² a)
U-value window frame	1,38 W/(m ² K)	Non-renewable Primary Energy (PE)	- kWh/(m ² a)
U-value glazing	0,53 W/(m ² K)	Pressurization test n ₅₀	0,2 h ⁻¹
Heat recovery	77,8 %		

Brief Description

Finch Residence, Waikuku Beach, New Zealand

This single family detached dwelling was envisaged by its owner and project manager, Paul Finch, as a modest, low-carbon, perfectly functioning home with the Passive House certification set as a goal from the very beginning. The mono-pitch roof, single storey dwelling has a living area of 137 m² as detailed below:



A draughtsman was used to develop a full set of drawings according to Paul's directions.

The project was heavily influenced by Paul's many years experience managing post-earthquake project in particular the use of SureFoot foundations driven into the ground with a suspended timber floor mounted on top. Whilst commonly used historically in New Zealand, suspended timber floors rather than concrete slab on grade floors are a relatively rare occurrence for New Zealand Passive House projects. The efficient and rapid construction approach continued with the use of Ethos Homes, an experience builder of Passive House homes in Christchurch and their prefabricated wall assemblies. The walls are lined on the inside with a building product made from waste cartons and coffee cups called SaveBoard, which both is thermally superior and lower carbon than plasterboard.

Paul managed the project throughout including the import of M-Sora windows and doors from Slovenia, a company that Paul carefully researched as whilst not the cheapest had a reputation for high performance Passive House certified components and value for money.

Paul did the taping of junctions and penetrations and combined with the panelised system used for the walls resulted in an outstanding blower door test result. The performance of the building since completion has been monitored as part of a BRANZ HEEP2 Study that used monitors and sensors throughout the house.

Regardless of the research study, the Finch family were supremely comfortable in their new home, with the heat pump used to provide cooling only been turned on once in the initial 12 months to check it worked. Night purging to provide ventilation has been sufficient to moderate summer spikes in temperature. Heating is provided by the occupants themselves, two heated towel rails and other internal heat gains.

Responsible project participants

Architect	Construct Drafting Services Ltd http://constructdrafting.co.nz
Project Manager	Paul Finch, Finbo Ltd https://finbo.org
Builder	Ethos Homes Ltd https://www.ethoshomes.co.nz
Building services	Dynamic Air and Electrical Ltd https://www.dynamicair.co.nz
Structural engineering	-
Building physics	Jonathan Holmes, VIA architecture Ltd https://via-architecture.net
Passive House project planning	Jonathan Holmes, VIA architecture Ltd https://via-architecture.net

Certifying body

Sustainable Engineering Ltd
<https://sustainableengineering.co.nz>

Certification ID

7455

Project ID (https://passivehouse-database.org/#d_7455)

Author of project documentation

Jonathan Holmes, VIA architecture Ltd
<https://via-architecture.net>

Date

22.04.2025

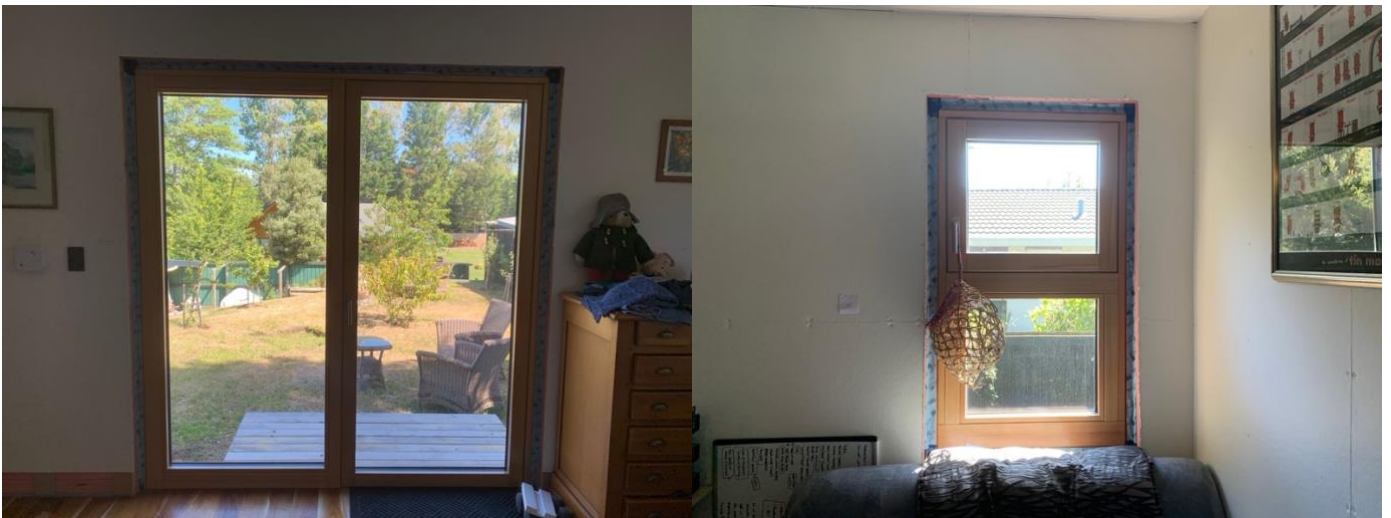
Signature



1. Overview photos



2. Interior photo example

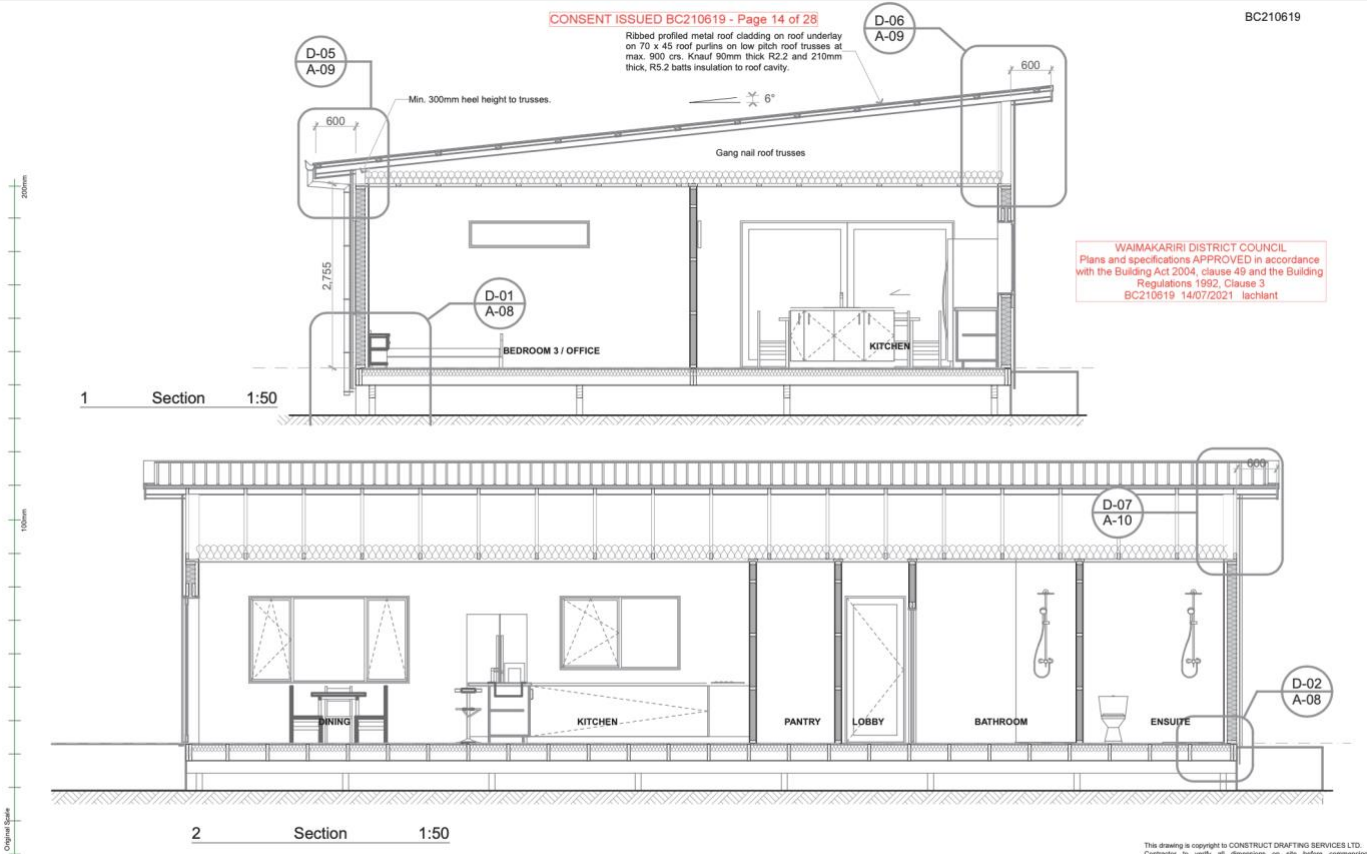


3. Sectional drawing

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BC210619

Ribbed profiled metal roof cladding on roof underlay on 70 x 45 roof purlins on low pitch roof trusses at max. 900 c/s. Knauf 50mm thick R2.2 and 210mm thick, R5.2 batts insulation to roof cavity.



WAIMAKARIRI DISTRICT COUNCIL
Plans and specifications APPROVED in accordance with the Building Act 2004, clause 49 and the Building Regulations 1992, Clause 3
BC210619 14/07/2021 lachant

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FINCH RESIDENCE
5 QUEENS AVENUE, WAIKUKU, NORTH CANTERBURY

Rev.	Date	Amendment



CONSTRUCT DRAFTING SERVICES LTD
Architectural Drafting & Design
Email: info@constructdrafting.co.nz
PO Box 10-048, Phillipstown, Christchurch 8145 - Ph. (03) 331 8269

Date:	30-Apr-21	Scale:	As shown @ A3
Drawn:	CC	Rev:	
Job No:	10673		
Drawing No:	A-04		

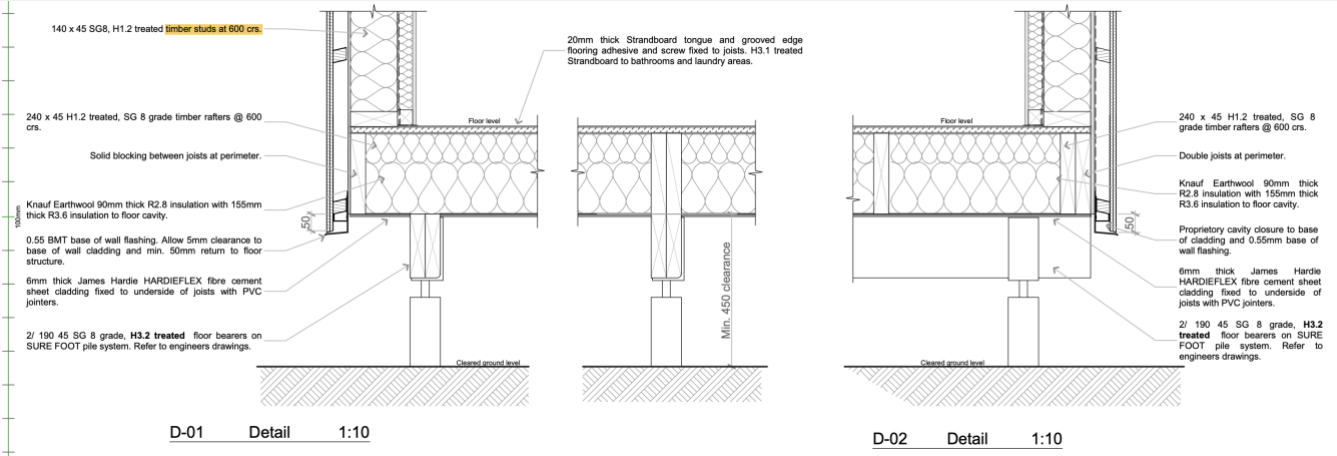
4. Floor plans

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Floor Plan 1:100

5. Floor slab construction

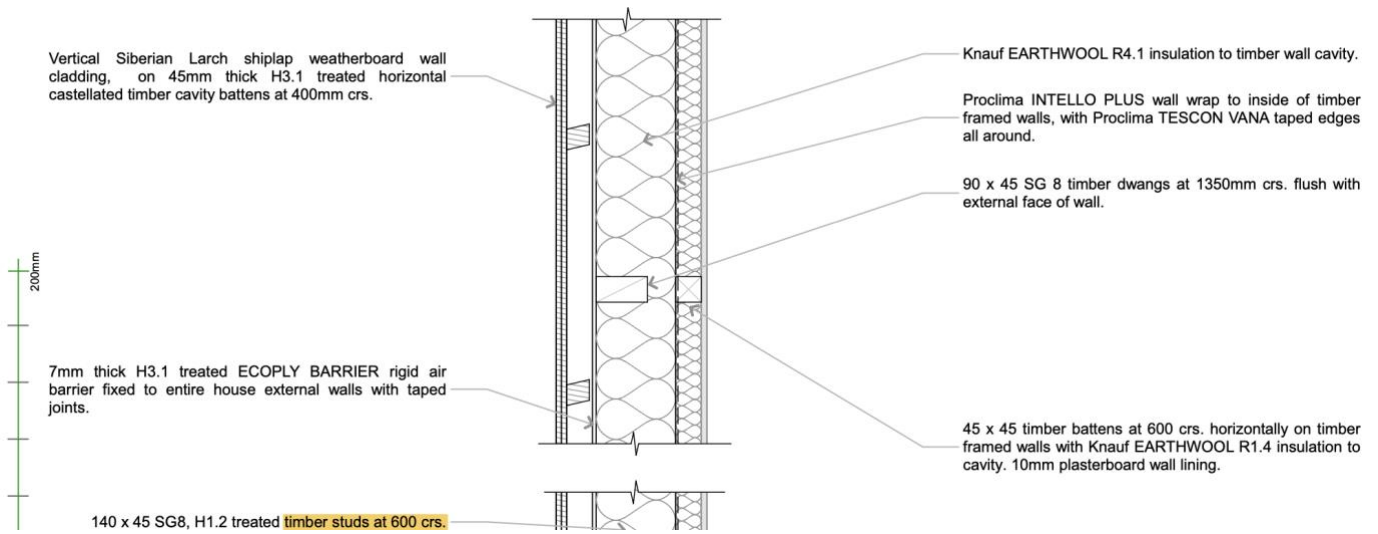


SureFoot floor substructure with suspended timber floor.



Assembly no.	Building assembly description					Interior insulation?
01ud	Floor					
Heat transmission resistance [m ² K/W]						
Orientation of building element		3-Floor		interior R _{si}	0.17	
Adjacent to		3-Ventilated		exterior R _{se}	0.17	
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Finish						
Strandboard	0.130					20
ecoinsulation Thermal Ceiling R3.6 @ 160mm	0.044	Timber framing 240mmx45mm @ 600 crs	0.130			150
Glassfibre Knauf Wall R2.8 @ 90mm	0.032	Timber framing 240mmx45mm @ 600 crs	0.130			90
Hardiflex fibre cement	0.580					6
R-Value		5.561				
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
90%		10.0%				26.6 cm
U-value supplement			U-value: 0.180 W/(m ² K)			

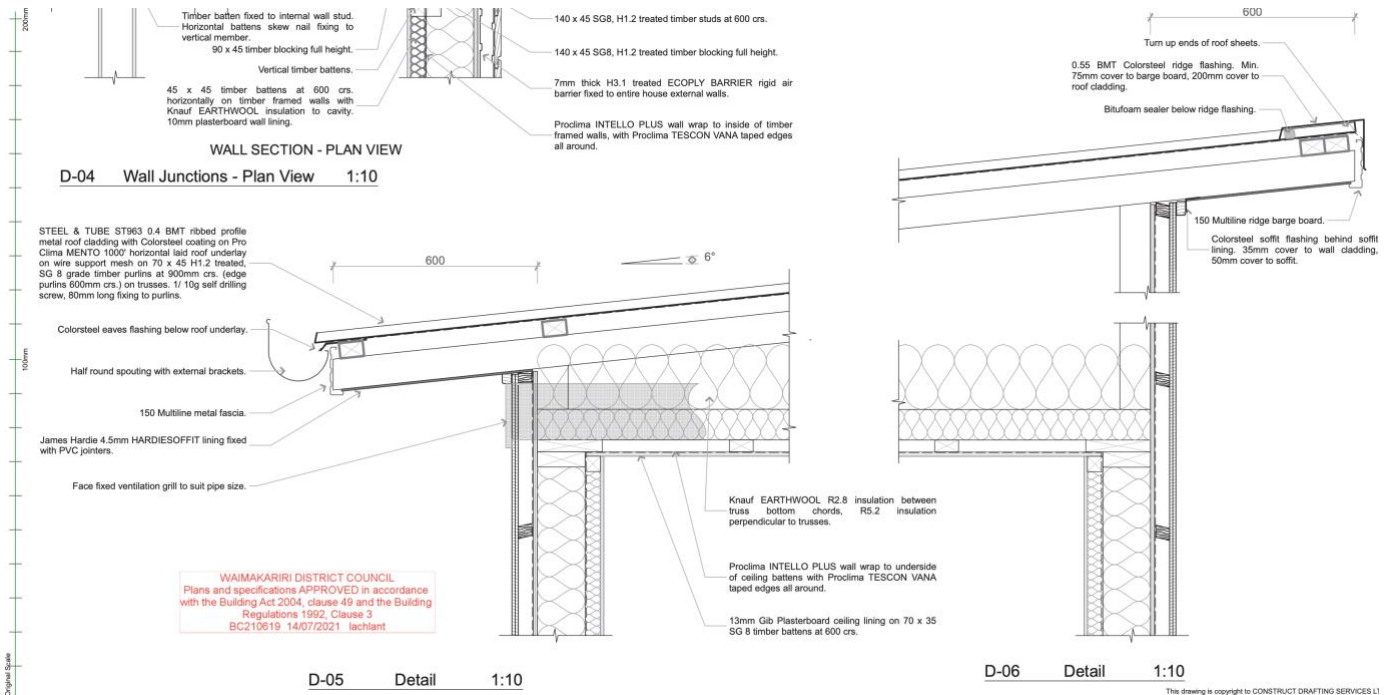
6. External wall construction



Timber frame walls insulated with Knauf Earthwool with 7mm ECOPLY bracing element and rigid air barrier to the exterior and ProClima Intello Plus wall membrane to the interior. A timber batten used to create a fully insulated service cavity and wall lining. The 10mm plasterboard wall lining per the drawings was substituted for SaveBoard.

Assembly no.		Heat transmission resistance [m ² K/W]				Interior insulation?
02ud	Wall	interior R _{si} : 0.13		exterior R _{se} : 0.13		
Orientation of building element: 2-Wall						
Adjacent to: 3-Ventilated						
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Cladding						
EcoPly	0.130					7
GlassfibreKnaufWallR4.1 @140mm	0.034	Timber framing 140mm x 45mm@ 600crs	0.130			140
GlassfibreKnaufWallR1.3 @50mm	0.038			Timber battens 45mm x 45mm@ 600 crs	0.130	45
Airtight membrane						
Saveboard	0.083					10
R-Value		4.815				
Percentage of sec. 1: 80%		Percentage of sec. 2: 10.0%		Percentage of sec. 3: 10.0%		Total: 20.2 cm
U-value supplement: [] W/(m ² K)		U-value: 0.208 W/(m ² K)				

7. Roof construction



A truss roof ceiling timber frame spans the interior between external walls filled with two layers of Knauf Glass fibre Batt insulation, the first layer between the truss chords and then the second layer at right angle to this first layer across the chords. Below which there is an airtight membrane, air gap service cavity and SaveBoard ceiling lining.

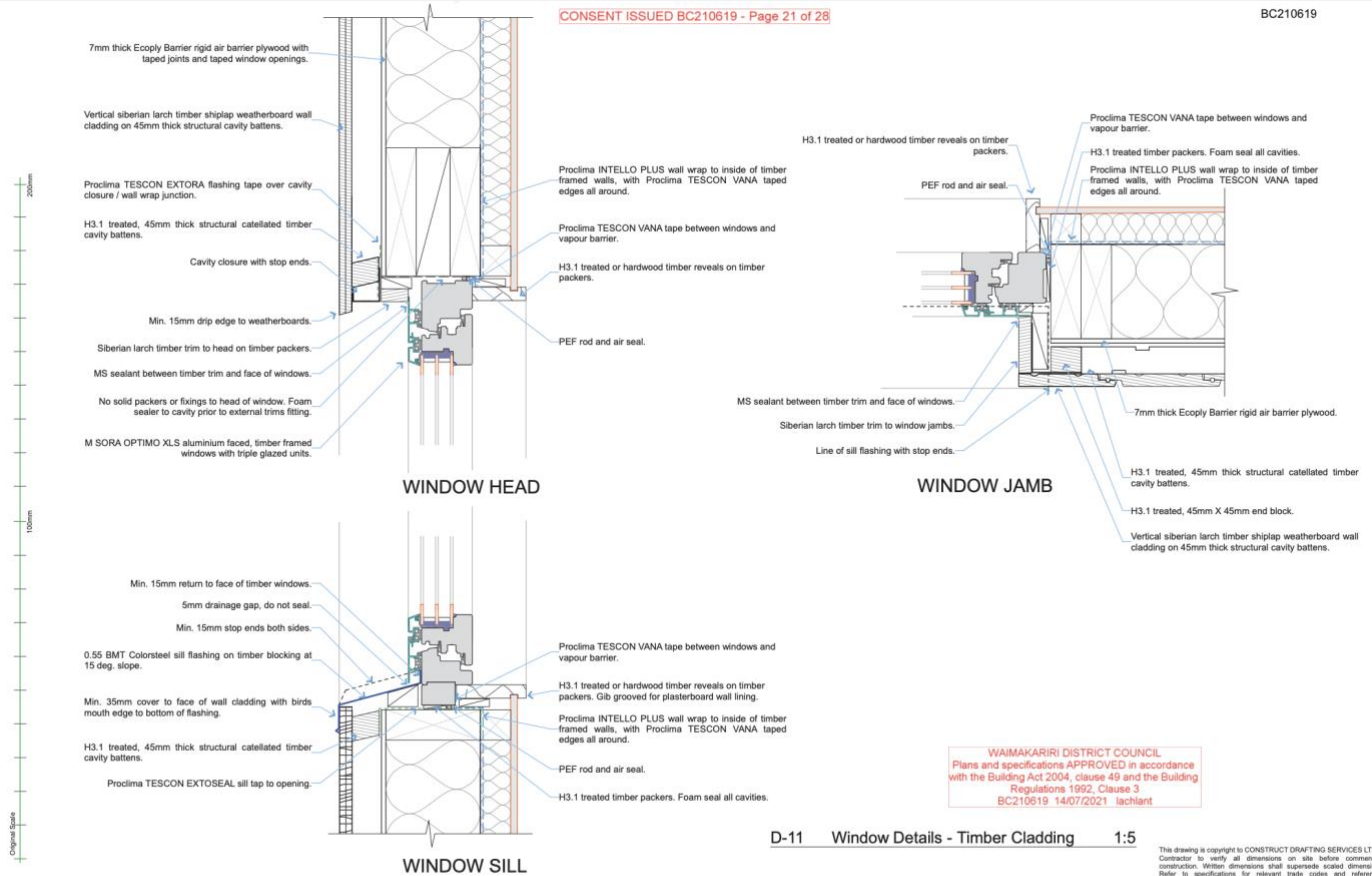


Assembly no.						Interior insulation?
03ud		Roof				
Heat transmission resistance [m ² K/W]						
Orientation of building element		1-Roof		interior R _{si}		0.10
Adjacent to		3-Ventilated		exterior R _{se}		0.10
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Cladding						
Weathertight membrane						
Glassfibre Knauf Ceiling Batt R5.2 @ 210mm	0.040					210
Glassfibre Knauf Wall R2.2 @ 90mm	0.041	Truss Chords 45mm @ 900 crs	0.130			90
Airtight membrane						
Air gap / service cavity for ducting - ref: Aux	0.612			Battens 100mm x 45mm @ 600 crs	0.130	100
Calc						
Saveboard	0.083					13
R-Value		7.799				
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
78%		7.5%		15.0%		41.3 cm
U-value supplement						U-value: 0.128 W/(m ² K)

8. Window and window installation

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BC210619



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Plans and specifications APPROVED in accordance with the Building Act 2004, clause 49 and the Building Regulations 1992, Clause 3 BC210619 14/07/2021 iachlant

D-11 Window Details - Timber Cladding 1:5

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Date:	Scale:
30-Apr-21	As shown @ A3
Drawn: CC	
Job No: 10673	Rev:
Drawing No: A-11	



Industrijska ulica 13, 4226 Žiri, Slovenija T +386 (0)4 505 02 00

THERMAL TRANSMITTANCE CALCULATION

Calculation num.: 173.1/12

PRODUCT STANDARD: EN 14351-1 + A1
CALCULATION STANDARD: EN 10077-2:2012
SOFTWARE: Winiso 2D

Product type: Comfort Optimo XLS
Product: Single leaf window
Frame material: Wood - spruce/fir (Picea Abies)



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THERMAL TRANSMITTANCE CALCULATION

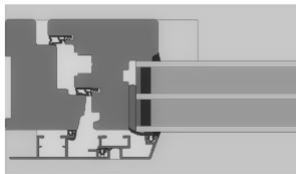
Calculation num.: 173.1/12

PRODUCT STANDARD: EN 14351-1 + A1
CALCULATION STANDARD: EN 10077-2:2012
SOFTWARE: Winiso 2D

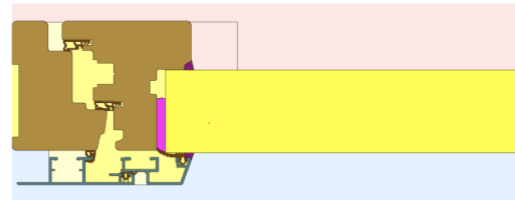
VALIDITY: The data and results refer solely to the described specimen or to the specimen of bigger dimension but with the same frame and glazing details.

WINDOW TYPE: Comfort Optimo XLS

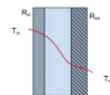
PRODUCT: Single tilt and turn window



Frame material: Wood - spruce/fir (Picea abies (L.) Karst) ($\lambda = 0,11 \text{ W/mK}$)
Thermal transmittance of frame: $U_f = 1,1 \text{ W/m}^2\text{K}$, $b = 104 \text{ mm}$
 $U_g = 0,5 \text{ W/m}^2\text{K}$
Thermal transmittance of glazing: $4/18\text{Ar}/4/18\text{Ar}/4$ (TGI Spacer)
Linear thermal transmittance of frame/glazing junction: $\Psi = 0,042 \text{ W/mK}$
Window dimension (w x h): 1230 mm x 1480 mm



Colour:	Material:	Thermal conductivity:
[Brown]	Spruce (Picea Abies)	0,110 W/mK
[Purple]	Polyurethane adhesive	0,250 W/mK
[Yellow]	Silicone pure	0,350 W/mK
[White]	Calibration panel	0,035 W/mK
[Green]	EPDM	0,250 W/mK
[Grey]	Aluminium, powder coated	160,0 W/mK, $\epsilon = 0,9$



$$U_f = 1,148 \text{ W/m}^2\text{K}$$

$$B_f = 104 \text{ mm}$$

Window frames

ID	Description	U-Value			
		left	right	bottom	above
		W/(m ² K)	W/(m ² K)	W/(m ² K)	W/(m ² K)
01ud	PH-FRAMES: average thermal quality	0.75	0.75	0.75	0.75
02ud	M-Sora Comfort Optimo XLS Window (General)	1.38	1.38	1.38	1.38
03ud					
04ud	M-Sora Comfort Optimo XLS Window (W-01) (Open)	1.38	1.38	1.38	1.38
05ud	M-Sora Comfort Optimo XLS Window (W-01) (Fixed)	1.38	1.38	1.38	1.38
06ud					
07ud	M-Sora Comfort Optimo XLS Sliding Door (D-02) (Open)	1.38	1.38	1.38	1.38
08ud	M-Sora Comfort Optimo XLS Sliding Door (D-02) (Fixed)	1.38	1.38	1.38	1.38
09ud					
10ud	M-Sora Comfort Optimo XLS Entrance Door (D-01) (Open)	1.12	1.38	1.96	1.38
11ud					
12ud	M-Sora Comfort Optimo XLS Hinged Door (D-04) (Open)	1.38	1.38	1.38	1.38
13ud	M-Sora Comfort Optimo XLS Hinged Door (D-04) (Fixed)	1.38	1.38	1.38	1.38
14ud					
15ud	M-Sora Comfort Optimo XLS Hinged Door (D-03) (Open)	1.38	1.38	1.38	1.38
16ud	M-Sora Comfort Optimo XLS Hinged Door (D-03) (Fixed)	1.38	1.38	1.38	1.38
17ud					
18ud	M-Sora Comfort Optimo XLS Window (W-02) (Open)	1.38	1.38	1.38	1.38
19ud	M-Sora Comfort Optimo XLS Window (W-02) (Fixed)	1.38	1.38	1.38	1.38
20ud	M-Sora Comfort Optimo XLS Window (W-02) (Open)	1.38	1.38	1.38	1.38
21ud					
22ud	M-Sora Comfort Optimo XLS Window (W-03) (Open)	1.38	1.38	1.38	1.38
23ud					
24ud	M-Sora Comfort Optimo XLS Hinged Window (W-04) (Open)	1.38	1.38	1.38	1.38
25ud	M-Sora Comfort Optimo XLS Fixed Window (W-04) (Fixed)	1.38	1.38	1.38	1.38
26ud					
27ud	M-Sora Comfort Optimo XLS Hinged Window (W-06) (Open)	1.38	1.38	1.38	1.38
28ud	M-Sora Comfort Optimo XLS Fixed Window (W-06) (Fixed)	1.38	1.38	1.38	1.38
29ud					
30ud	M-Sora Comfort Optimo XLS Window (W-07) (Open)	1.38	1.38	1.38	1.38
31ud					
32ud	M-Sora Comfort Optimo XLS Window (W-08) (Open)	1.38	1.38	1.38	1.38
33ud					
34ud	M-Sora Comfort Optimo XLS Hinged Window (W-09) (Open)	1.38	1.38	1.38	1.38
35ud	M-Sora Comfort Optimo XLS Fixed Window (W-09) (Fixed)	1.38	1.38	1.38	1.38
36ud					
37ud	Discount factor for conversion of timber windows/hinged doors/sliding door frame from Spruce (L=0.11) for Larch (L=0.13) 18% or no discount 0% - insulation info provided by M-Sora.	20%			

Description of the window (frame) construction, manufacturer	M-Sora
Make window (frame; product name)	Wooden window frames with aluminium cladding.
Frame U-value U_f	1.38 W/(m ² K)
Glazing construction	Argon filled; 4 18 4 18 4
Glass U-value U_g	0.53 W/(m ² K)
G-value of the glazing	0,54

9. Description of the airtight envelope

The final pressure test was carried out on 15.3.2023 by Richard Walklin ofEdge Innovation.

Test Results at 50 Pascals:	<u>Depressurization</u>	<u>Pressurization</u>	<u>Average</u>
q ₅₀ : m ³ /h (Airflow)	81 (+/- 2.9 %)	75 (+/- 1.7 %)	78
n ₅₀ : 1/h (Air Change Rate)	0.22	0.21	0.22
q _{F50} : m ³ /(h·m ² Floor Area)	0.57	0.53	0.55
q _{E50} : m ³ /(h·m ² Envelope Area)	0.17	0.16	0.17
Leakage Areas:			
ELA ₅₀ : m ²	0.0025 (+/- 1.7 %)	0.0023 (+/- 1.7 %)	0.0024
ELA _{F50} : m ² /m ²	0.0000173	0.0000161	0.0000167
ELA _{E50} : m ² /m ²	0.0000052	0.0000049	0.0000050
Building Leakage Curve:			
Air Flow Coefficient (C _{env}) m ³ /(h·Pa ⁿ)	3.8 (+/- 18.8 %)	4.1 (+/- 20.9 %)	
Air Leakage Coefficient (C _L) m ³ /(h·Pa ⁿ)	3.9 (+/- 18.8 %)	4.1 (+/- 20.9 %)	
Exponent (n)	0.778 (+/- 0.053)	0.744 (+/- 0.055)	
Coefficient of Determination (r ²)	0.99300	0.99174	
Test Standard:	ISO 9972		
Test Mode:	Depressurization and Pressurization		
Type of Test Method:	Method 1 - Test of Building in use		
Purpose of Test:	Occupancy Test n ₅₀ ≤ 0.6 1/h		

Air tightness concept

Walls: Airtight membrane from ProClima

Floor: Strandboard

Connection window: Airtight tape from ProClima

Ceiling/Roof: Airtight membrane from ProClima



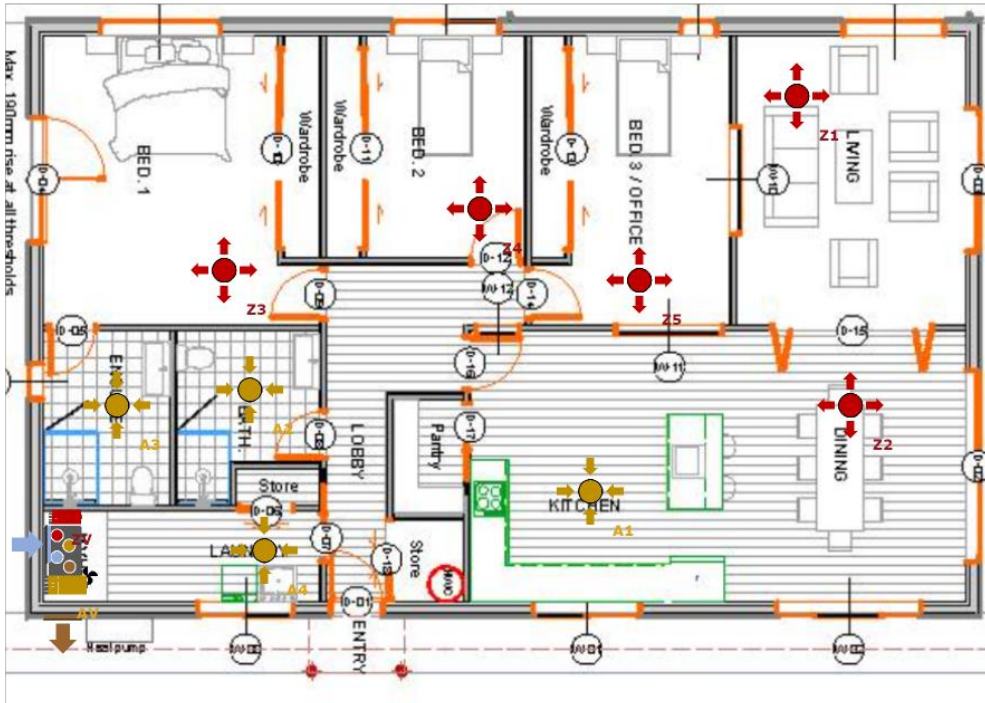
10. Ventilation unit

To greatly reduce ventilation losses, a balanced supply/exhaust air system with a highly efficient counterflow air-to-air heat exchanger was used.



Make ventilation system	Stiebel Eltron
effective heat supply rate	78 %
Electrical efficiency	0.27 Wh/m ³

11. Ventilation planning sewer network

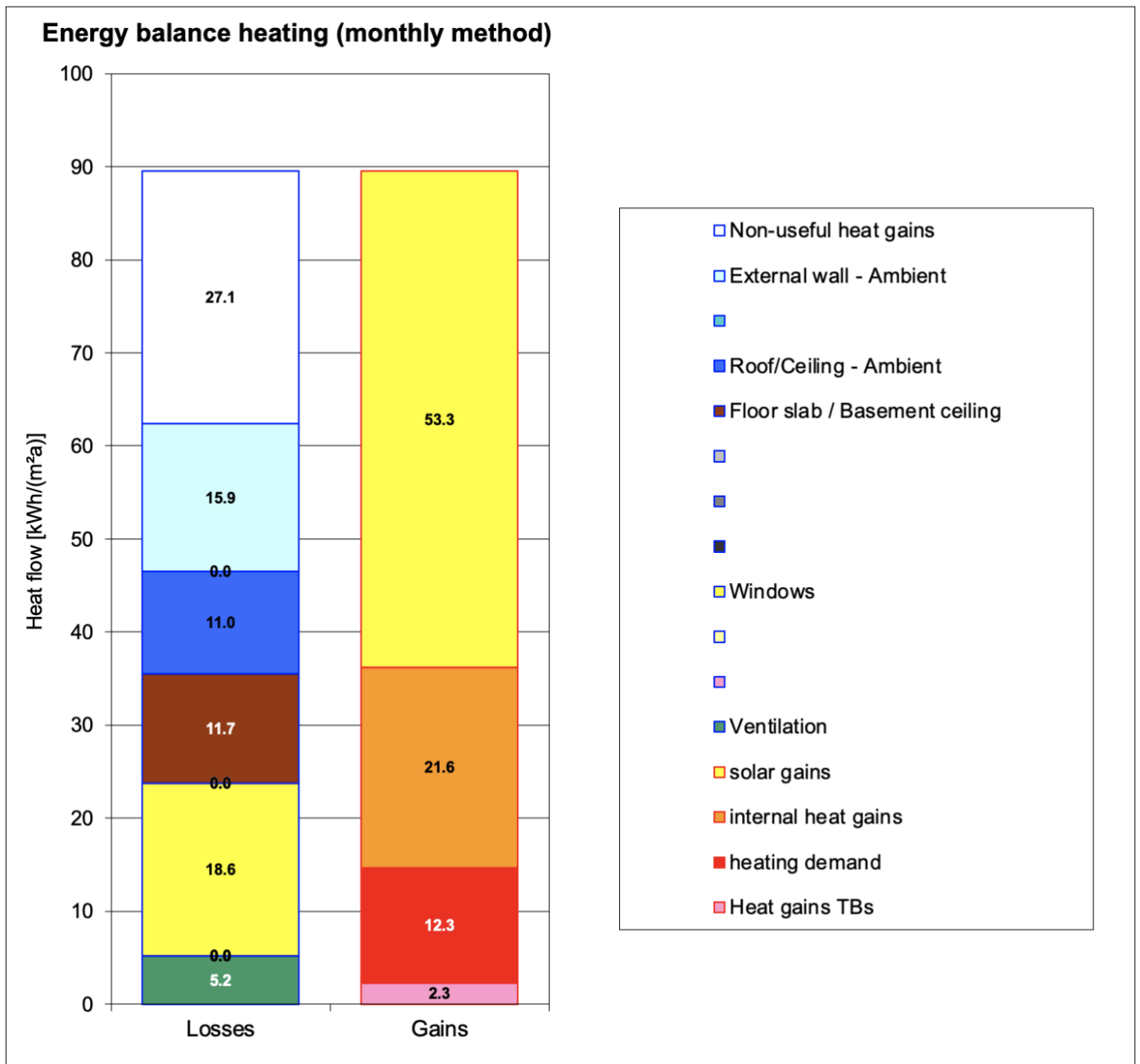


Supply air rooms are all main rooms (left in red: supply air ducts): Bed1, Bed2, Bed3/Office, living room and dining room.

Exhaust air rooms are bathroom, ensuite, Laundry and the kitchen.

The overflow takes place through undercut doors and entrance lobby. From here, the stale air is returned to the heat exchanger via an exhaust duct network (shown in sand colour in the picture on the left).

12. Heat supply



About 60% is the solar contribution from windows and the remaining hot water and space heating is provided by heat pumps.





Econergy® heat pump water heaters are designed to cover the range of hot water needs of New Zealand homes. Each unit is easily connected to an existing hot water cylinder or Econergy® heat pump ready cylinder via insulated water pipes and dual interconnect cables.


CONNECTS
TO NEW &
EXISTING
HOT WATER
CYLINDERS

GUARANTEED
66% OFF
YOUR HOT
WATER
BILLS*



13. PHPP results

Passive House Verification



Building: Finch Residence
 Street: 5 Queens Avenue
 Postcode/City: 7402 Waikuku Beach
 Province/Country: North Canterbury NZ-New Zealand
 Building type: Single Residence
 Climate data set: NZ0003b-Christchurch
 Climate zone: 4: Warm-temperate Altitude of location: 20 m

Home owner / Client: Paul Finch
 Street: 5 Queens Avenue
 Postcode/City: 7402 Waikuku Beach
 Province/Country: North Canterbury NZ-New Zealand

Mechanical engineer: (Builder) Ethos Homes Ltd.
 Street: 257 Knowles Street
 Postcode/City: 8052 Christchurch
 Province/Country: NZ-New Zealand

Certification: Sustainable Engineering Limited
 Street: 65B Hungerford Road, Houghton Bay
 Postcode/City: 6023 Houghton Bay
 Province/Country: Wellington NZ-New Zealand

Architecture: Construct Drafting Services Ltd Street: PO Box 10-048 Postcode/City: 8145 Christchurch Province/Country: Canterbury NZ-New Zealand	Mechanical engineer: (Builder) Ethos Homes Ltd. Street: 257 Knowles Street Postcode/City: 8052 Christchurch Province/Country: NZ-New Zealand	
Energy consultancy: VIA architecture Ltd Street: PO Box 1707 Postcode/City: 5252 Paraparaumu Beach Province/Country: NZ-New Zealand	Certification: Sustainable Engineering Limited Street: 65B Hungerford Road, Houghton Bay Postcode/City: 6023 Houghton Bay Province/Country: Wellington NZ-New Zealand	
Year of construction: 2023	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]: 2.5	IHG cooling case [W/m²]: 2.5
No. of occupants: 2.8	Specific capacity [Wh/K per m² TFA]: 60	Mechanical cooling:

Specific building characteristics with reference to the treated floor area		Criteria		Alternative criteria		Fulfilled? ²
Space heating	Treated floor area m²	136.83				
	Heating demand kWh/(m²a)	12.34	≤	15	-	yes
	Heating load W/m²	9.51	≤	-	10	yes
Space cooling	Cooling & dehum. demand kWh/(m²a)	-	≤	-	-	-
	Cooling load W/m²	-	≤	-	-	-
	Frequency of overheating (> 25 °C) %	5.18	≤	10		yes
	Frequency of excessively high humidity (> 12 g/kg) %	0	≤	20		yes
Airtightness	Pressurization test result n ₅₀ 1/h	0.2	≤	0.6		yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	61	≤	-		-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	27	≤	60	60	yes
	Generation of renewable energy (in relation to projected building footprint area) kWh/(m²a)	0	≥	-	-	

² Empty field: Data missing; '-': No requirement