

Project Documentation Gebäude-Dokumentation

Abstract | Zusammenfassung



Single family home in Collaroy Plateau, New South Wales, Australia

Project ID on the Passive House Database: 7830

Data of building | Gebäudedaten

Year of construction Baujahr	2023	Space heating Heizwärmebedarf	8 kWh/(m ² a)
U-value external wall U-Wert Außenwand	0,349 W/(m ² K)		
U-value basement U-Wert Kellerdecke	0,295 W/(m ² K)	Primary Energy Renewable (PER) Erneuerbare Primärenergie (PER)	69 kWh/(m ² a)
U-value roof U-Wert Dach	0,193 W/(m ² K)	Generation of renewable Energy Erzeugung erneuerb. Energie	93 kWh/(m ² a)
U-value window U-Wert Fenster	1,05 W/(m ² K)	Non-renewable Primary Energy (PE) Nicht erneuerbare Primärenergie (PE)	158 kWh/(m ² a)
Heat recovery Wärmerückgewinnung	76 %	Pressurization test n ₅₀ Drucktest n ₅₀	0,12 h-1
Special features Besonderheiten	CLT construction with external mineral wool insulation		

Brief Description

Collaroy Plateau Passive House

The project has achieved 'Classic' Passive House certification, ensuring exceptional energy efficiency and occupant comfort. The building features a cross-laminated timber (CLT) structure, with the CLT fully exposed internally, contributing to the design's aesthetic appeal. This newly constructed, freestanding single-family home in New South Wales, Australia, is located within a warm climate zone according to PHI climate zone map.

A 10kW solar photovoltaic system is installed on the rooftop, enhancing the home's sustainability by generating renewable energy.

The CLT elements, including walls, roof, and floor, serve as the building's airtight layer, crucial for maintaining energy efficiency. High-performance, triple-glazed windows and doors with timber frames and external aluminum cladding are utilised to optimize thermal performance.

Continuous external thermal insulation is applied outside the CLT to minimize thermal bridging, further improving energy efficiency. An external vapor-permeable membrane is implemented on the outer side of the insulation to protect both the insulation and the CLT structure.

Kurzbeschreibung

Collaroy Plateau Passive House

Das Projekt hat die Zertifizierung als „Classic“ Passivhaus erhalten und gewährleistet außergewöhnliche Energieeffizienz sowie hohen Wohnkomfort. Das Gebäude verfügt über eine Struktur aus Brettsperrholz (CLT), das innen vollständig sichtbar bleibt und so zur ästhetischen Gestaltung beiträgt.

Dieses neu errichtete, freistehende Einfamilienhaus in New South Wales, Australien, befindet sich gemäß der PHI-Klimazonenkarte in einer warmen Klimazone.

Eine 10-kW-Photovoltaikanlage ist auf dem Dach installiert und trägt zur Nachhaltigkeit des Hauses bei, indem sie erneuerbare Energie erzeugt.

Die CLT-Elemente – einschließlich Wände, Dach und Boden – bilden die luftdichte Schicht des Gebäudes, die für die Aufrechterhaltung der Energieeffizienz entscheidend ist. Hochleistungsfähige, dreifach verglaste Fenster und Türen mit Holzrahmen und äußerer Aluminiumbeschichtung werden verwendet, um die thermische Leistung zu optimieren.

Durchgehende externe Wärmedämmung wird außen auf das CLT aufgebracht, um Wärmebrücken zu minimieren und die Energieeffizienz weiter zu verbessern. Eine dampfdurchlässige Außenmembran schützt sowohl die Dämmung als auch die CLT-Struktur.

Responsible project participants

Verantwortliche Projektbeteiligte

Architect Entwurfsverfasser	Samuela Madej-Murphy 65 Richard Road 2015 Scotland Island, Australia
Implementation planning Ausführungsplanung	Samuela Madej-Murphy
Building systems Haustechnik	Conor Murphy 65 Richard Road 2015 Scotland Island, Australia
Structural engineering Baustatik	
Building physics Bauphysik	Laros Consulting (https://www.laros.com.au/)
Passive House project planning Passivhaus-Projektierung	Laros Consulting (https://www.laros.com.au/)
Construction management Bauleitung	Conor Murphy
Certifying body Zertifizierungsstelle	
Detail Green, Victoria, Australia https://detailgreen.com.au/ Passivhaus Institut Darmstadt www.passiv.de	
Certification ID Zertifizierungs ID	45122_DGREEN_PH_20241015_EI
Project-ID (www.passivehouse-database.org) Projekt-ID (www.passivhausprojekte.de)	7830
Author of project documentation Verfasser der Gebäude-Dokumentation	Toby (Wei) Yang - Laros Consulting 7/8 Beaconsfield Street 2609 Fyshwick, Australia
Date/Datum	Signature/Unterschrift
11/03/2025	

Exterior photos/ Außenfotos

East view



Main entry



West
view



West
view



Interior photos/Innenfotos

Internal view
Bedroom 1



Internal view
EntryHall



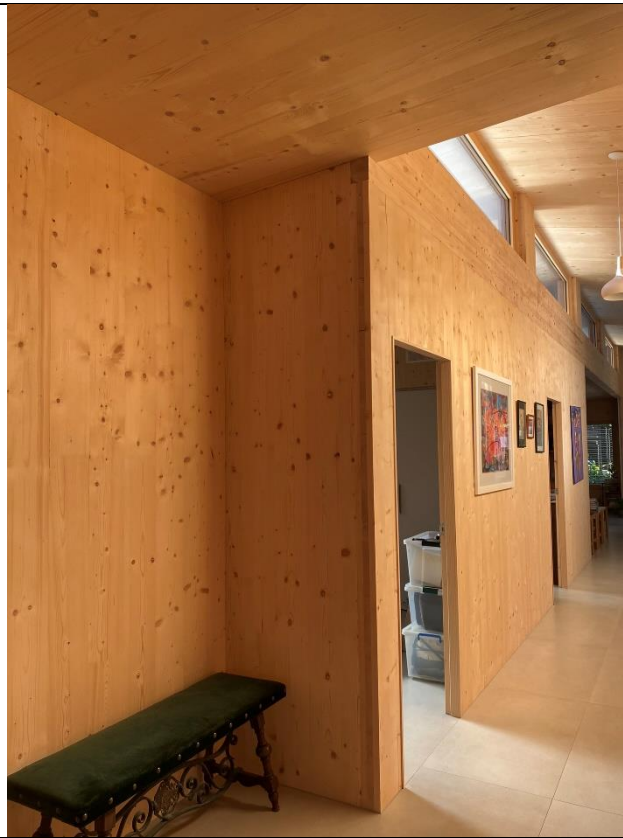
Internal view
Living/Dining



Internal view
EntryHall



Internal view
EntryHall



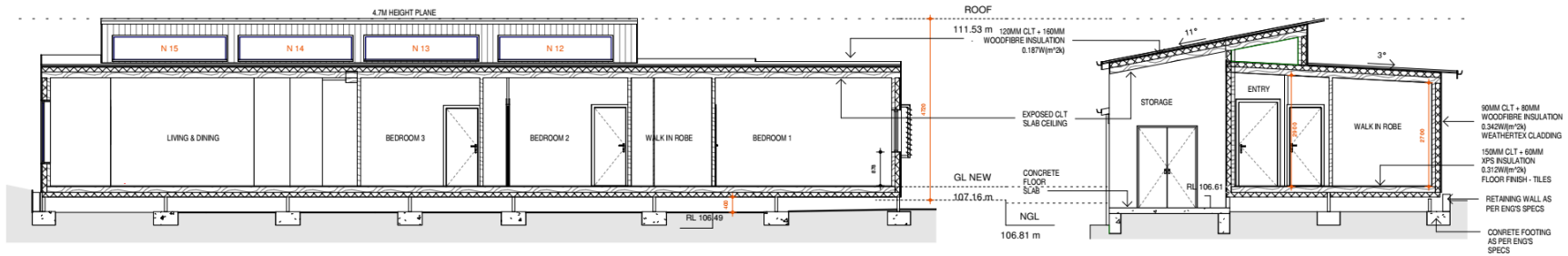
Internal view
EntryHall



Internal view
EntryHall



Sections/ Abschnitte

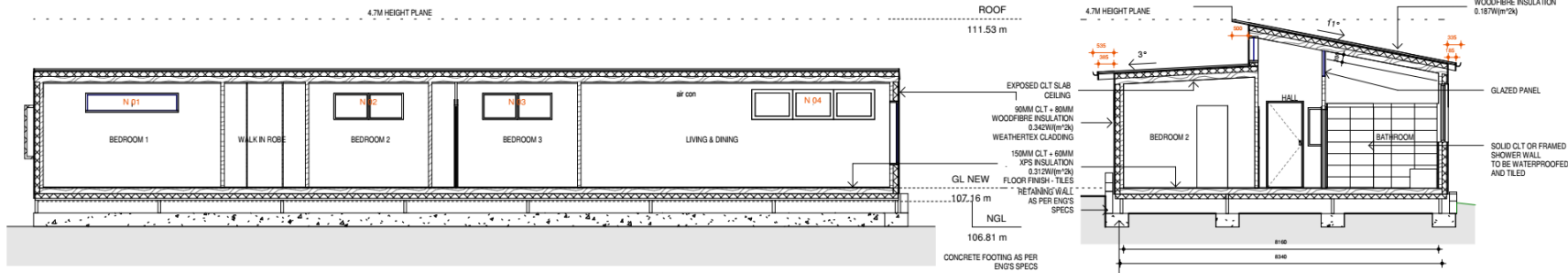


SECTION D

1 : 100

SECTION A

1 : 100



SECTION C

1 : 100

SECTION B

1 : 100

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Building Designer	SAMUELA MADEJ - MURPHY
Address	PO Box 253 Church Point NSW 2105
Contact	E: samuelam@hotmial.com P: 0450 531 573

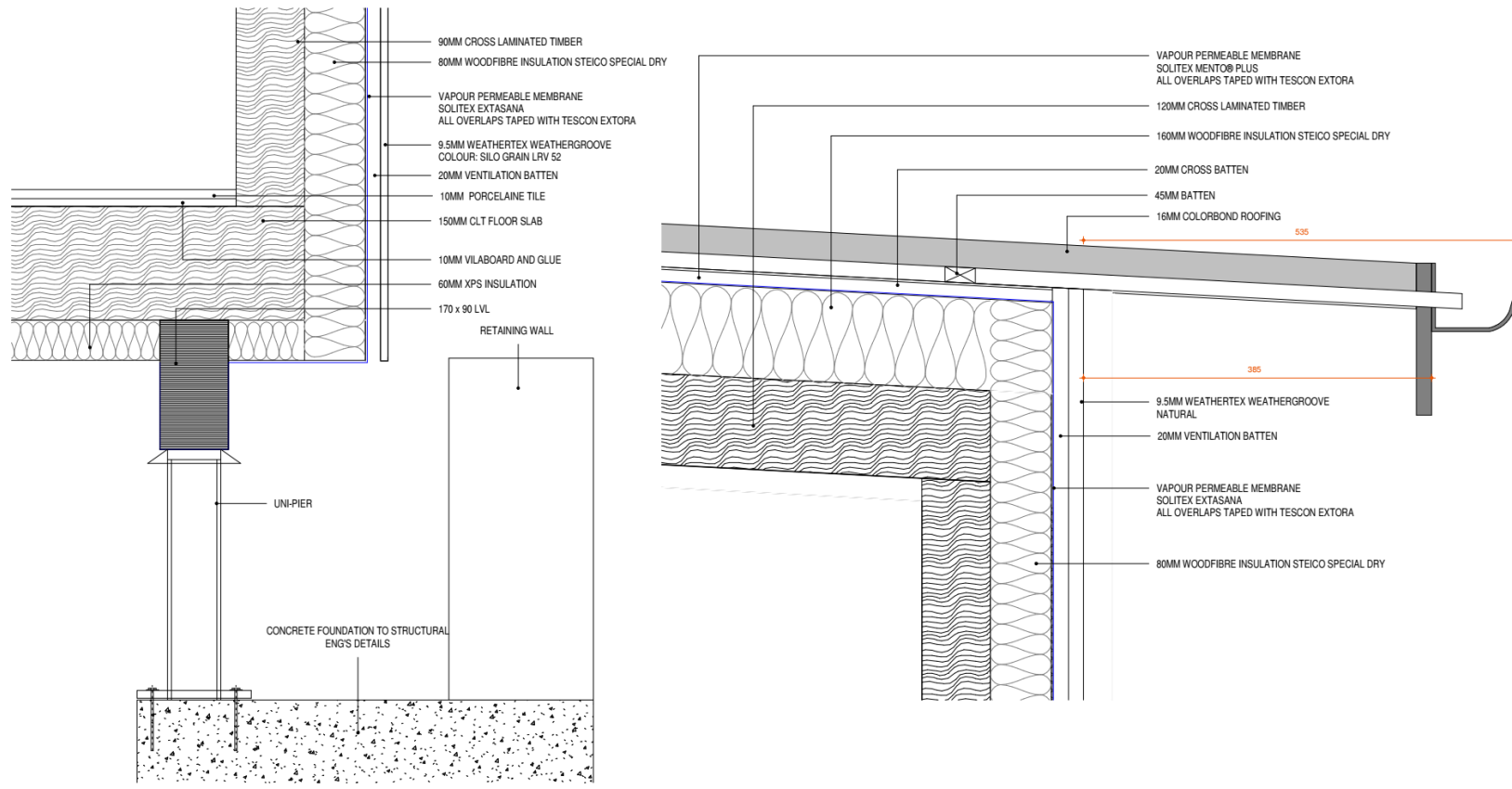
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Date	Discription
21.03.23	CONSTRUCTION SET
06.03.24	PH CERTIFICATION SET

Client	Jenny & Geoff Kriz
Address	39 Stella St Collaroy Plateau

COLLAROY HOUSE	
SECTIONS	
Scale	1 : 100 A3
N	
A 5.1	



FLOOR TO WALL CONNECTION DETAIL

1:5

ROOF TO WALL CONNECTION DETAIL

1:5

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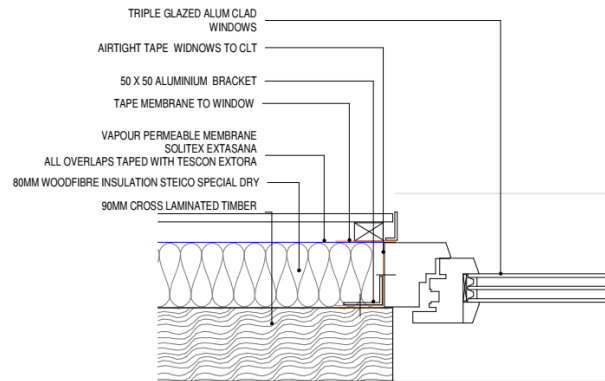
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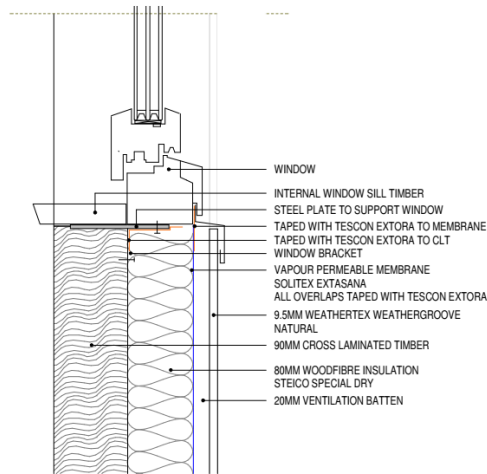
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Address	39 Stella St Collaroy Plateau

COLLAROY HOUSE	
EXTERNAL DETAILS 1	
Scale	1:5 A3
A 5.2	



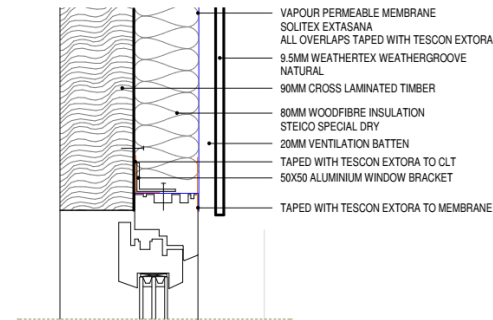
WINDOW PLAN DETAIL

1:5



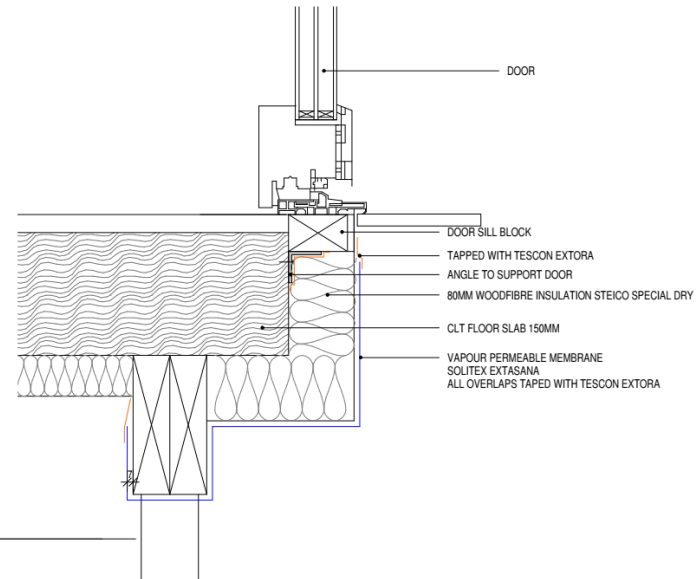
WINDOW BOTTOM DETAIL / SILL

1:5



WINDOW TOP DETAIL

1:5



DOOR SILL DETAIL

1:5

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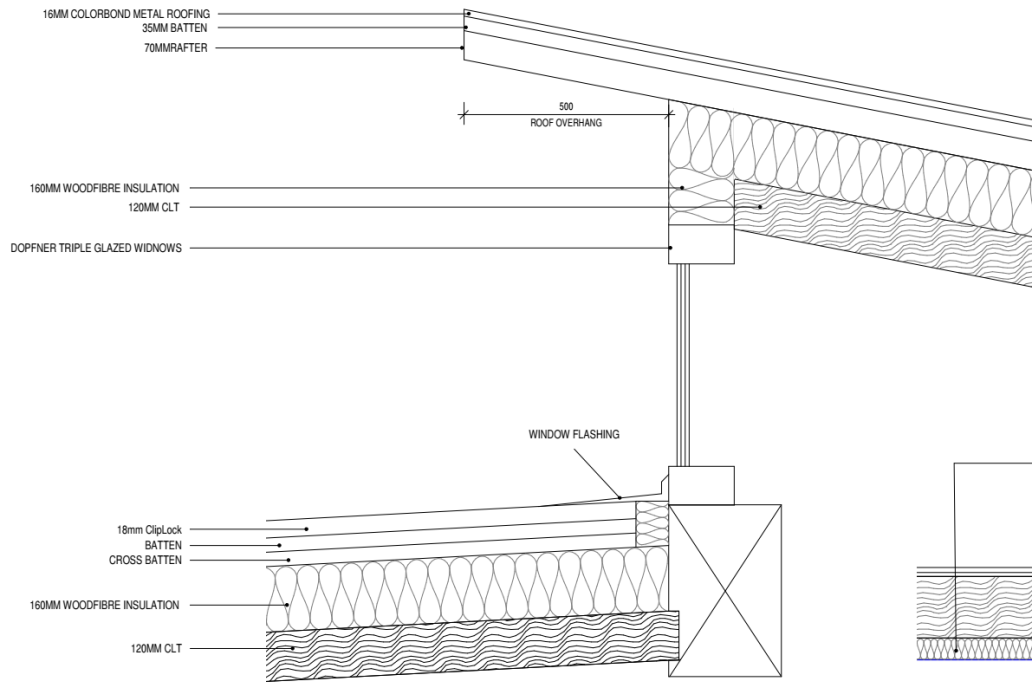
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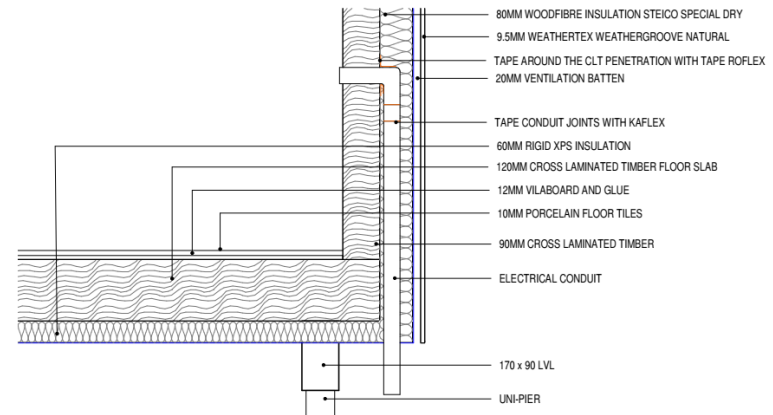
Client	Jenny & Geoff Kris
Address	39 Stella St Collaroy Plateau

COLLAROY HOUSE	
EXTERNAL DETAILS 2	
Scale	1:5 A3
A 5.4	



WINDOW & OVERHANG DETAIL

1 : 10



DETAIL - THERMAL ENVELOPE PENETRATION

1 : 10

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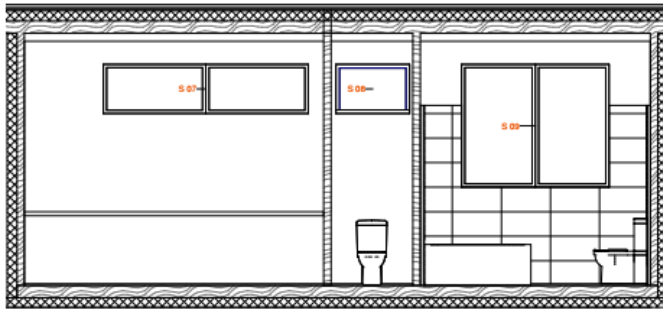
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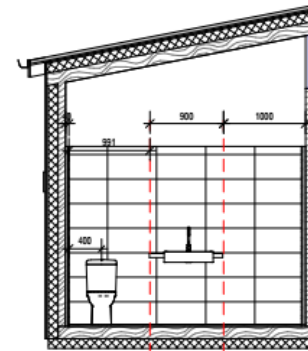
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Address	39 Stella St Collaroy Plateau

COLLAROY HOUSE	
EXTERNAL DETAILS 3	
Scale	1 : 10 A3
A 5.5	



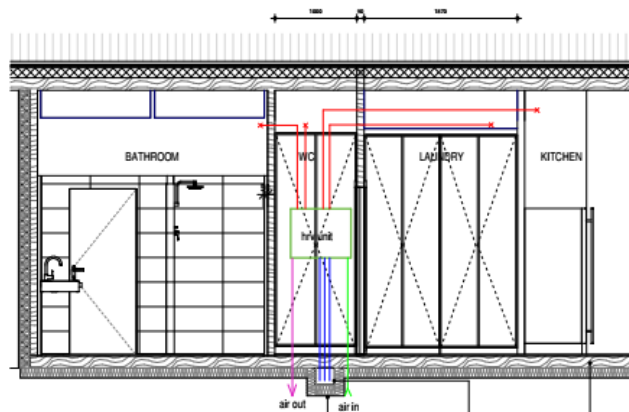
BATH S WC LAUNDRY

1 : 50



BATHROOM WEST

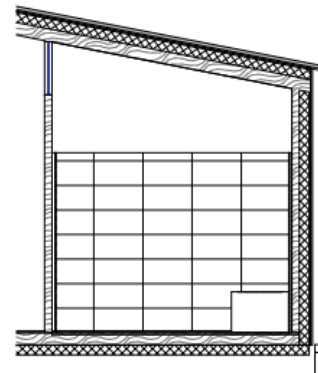
1 : 50



BATH N, WC, LAUNDRY

1 : 50

80mm rigid XPS insulation
channel for air in pipes to be distributed to bedrooms
150mm CLT floor slab



BATHROOM EAST

1 : 50

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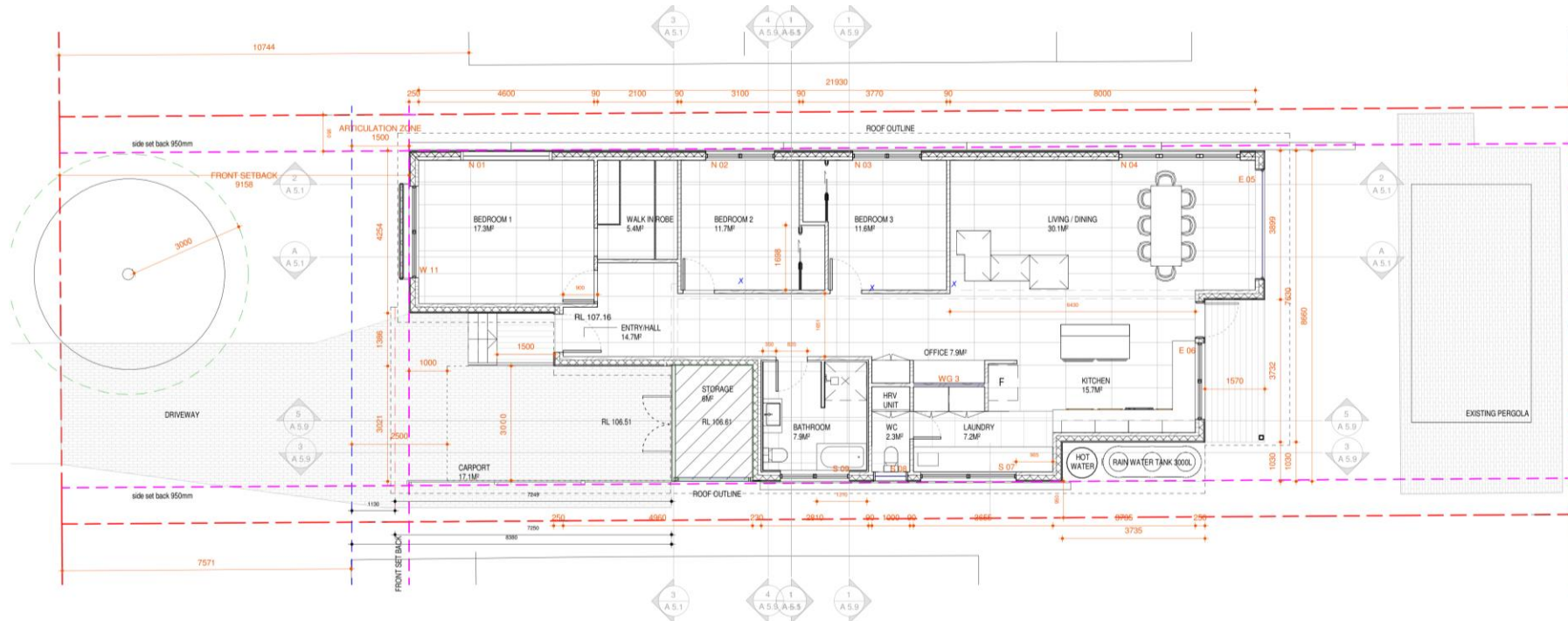
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COLLARDY HOUSE	
BATHROOM ELEVATIONS	
Scale	1 : 50 A3
A 5.9	

Plan/ Planen



FLOOR PLAN PROPOSED - CDC

1 : 100

Construction Notes

All construction to comply with current BCA codes and Australian Standards.
Structural elements (beams, posts, decks, pergolas) to be designed & specified by the engineer.
Demolition works to be carried out in accordance with the requirements of A2601-2001.
Termite protection to be in accordance with AS 3600.1
Stormwater system to be connected to existing.
All timber framing shall comply with AS1684
These documents must be read in conjunction with all the sub-consultants reports and recommendations.
The architectural documents form part of the total construction set and are not to be taken as exclusively being the building construction documents



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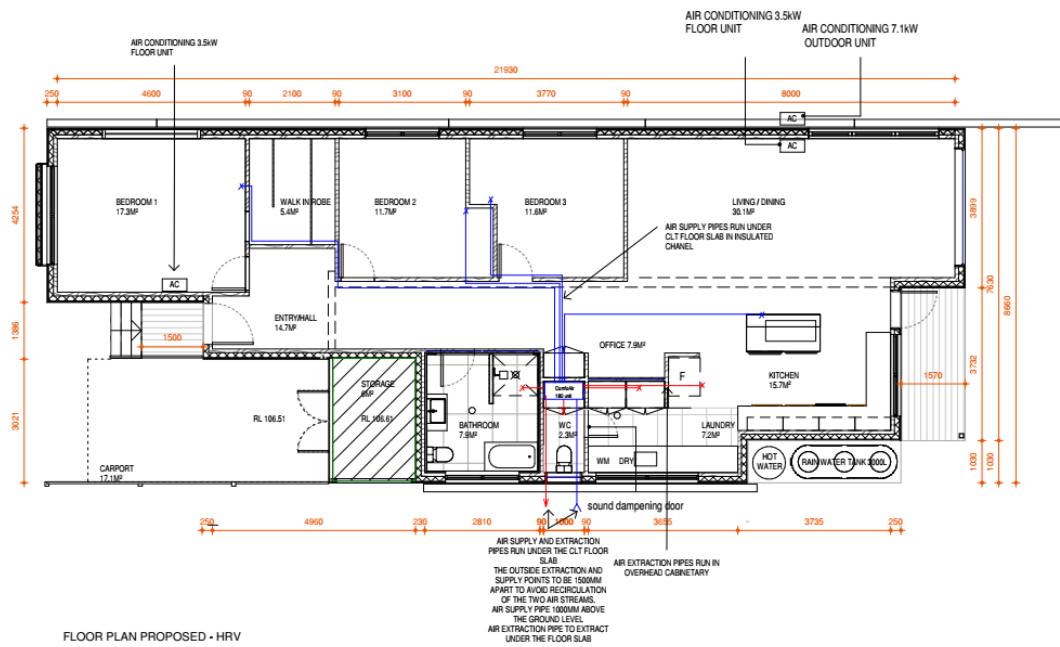
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COLLAROY HOUSE	
FLOOR PLAN	
Scale	As indicated A3
N	
A 3.1	



FLOOR PLAN PROPOSED - HRV

1 : 100

Ultra Compact – Maximum Comfort

The Zehnder ComfoAir 180 is an ultra-compact, heat recovery ventilation system that is highly suited to new builds and renovation projects. The ComfoAir extracts air from wet rooms (kitchens and bathrooms) to provide maximum comfort with simple operation and high efficiency. It extracts the heat energy which would have otherwise been lost during the extract process and transfers this to the fresh, filtered supply air which is drawn in from outside.

This is done using high efficiency counter flow heat exchangers which can recover up to 90% of the heat.

Features

- Ideal for installation into a kitchen or bathroom cupboard
- Automatic 100% filtered bypass
- Designed for use with the unique ComfoPlus Plus Tilt Duct system
- Features an additional supply air connection at the bottom of the unit for added installation flexibility
- Certified as an official Pressure House component by the Passivhaus Institute

Specifications

Weight: 27kg
 Ducting: 4 x 200 x 20mm supply
 1 x 100mm external supply air connector

Compliance: 2016
 Materials: Internal body: GPP / PA
 Control unit: Control unit
 Fans: EC
 Filters: 2-stage, G4
 Supply air option: F7

Technical Data

Flow Rate (m³/h)	Pressure Loss (Pa)	Supply Air Temp (°C)	Exhaust Air Temp (°C)
100	10	15	15
200	20	15	15
300	30	15	15
400	40	15	15
500	50	15	15
600	60	15	15
700	70	15	15
800	80	15	15
900	90	15	15
1000	100	15	15

Further Information:
 Fantech Pty. Ltd.
 Australia: Phone: 08 8364 7813
 Email: sales@fantech.com.au
 Web: www.fantech.com.au

New Zealand:
 Phone: 081 584 6888
 Email: nzsales@fantech.co.nz
 Web: nz.fantech.co.nz

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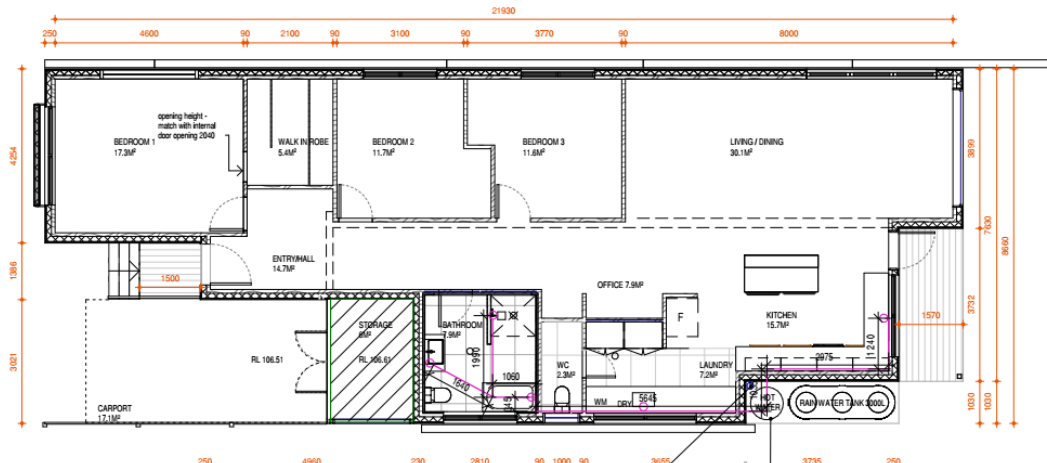
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Address	39 Stella St Collaroy Plateau

COLLAROY HOUSE			
FLOOR PLAN PROPOSED - HRV			
Scale	As indicated	A3	A 3.3



FLOOR PLAN PROPOSED - HOT WATER PLAN

1 : 100

Airation vent
All sewer drainage pipes to be plumbed under the CLT floor slab & XPS insulation layer (outside the thermal envelope); all penetration point to be sealed with tapes

Hot water tank - Rheem Stellar 160 litre Stainless Steel model 4A1160
Hot water plumbing to be run under the CLT slab and the XPS insulation HW pipes penetration through the thermal envelope to be sealed with tapes

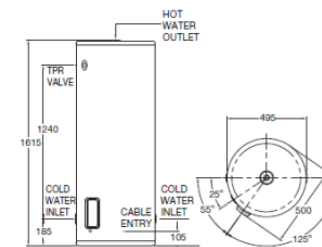
5 X HOT WATER TAPS

Rheem Electric Stellar® SS 160L 2 - 4 Indoor/Outdoor
4A1160 PEOPLE INSTALLATION



Features & Benefits

- Stainless steel cylinder and water fittings resist corrosion for longer, extending product life
- Dual handed fittings located on the front of the water heater
- 12% better performance than MEPS reduces energy use, saving money
- Up to 42% lighter² - for easier handling and installation
- Australian made
- 12 year cylinder warranty¹



MODEL	4A1160
Hot Water Delivery (L)	160
kW Rating	2.4, 3.6
Relief Valve Pressure (kPa)	1400
Expansion Control Valve (kPa)	1200
Max Water Supply Pressure:	
with ECV (kPa)	960
without ECV (kPa)	1120
Water Connections	Rp 3/4
Approx. Weight (packaged) kg	37



36

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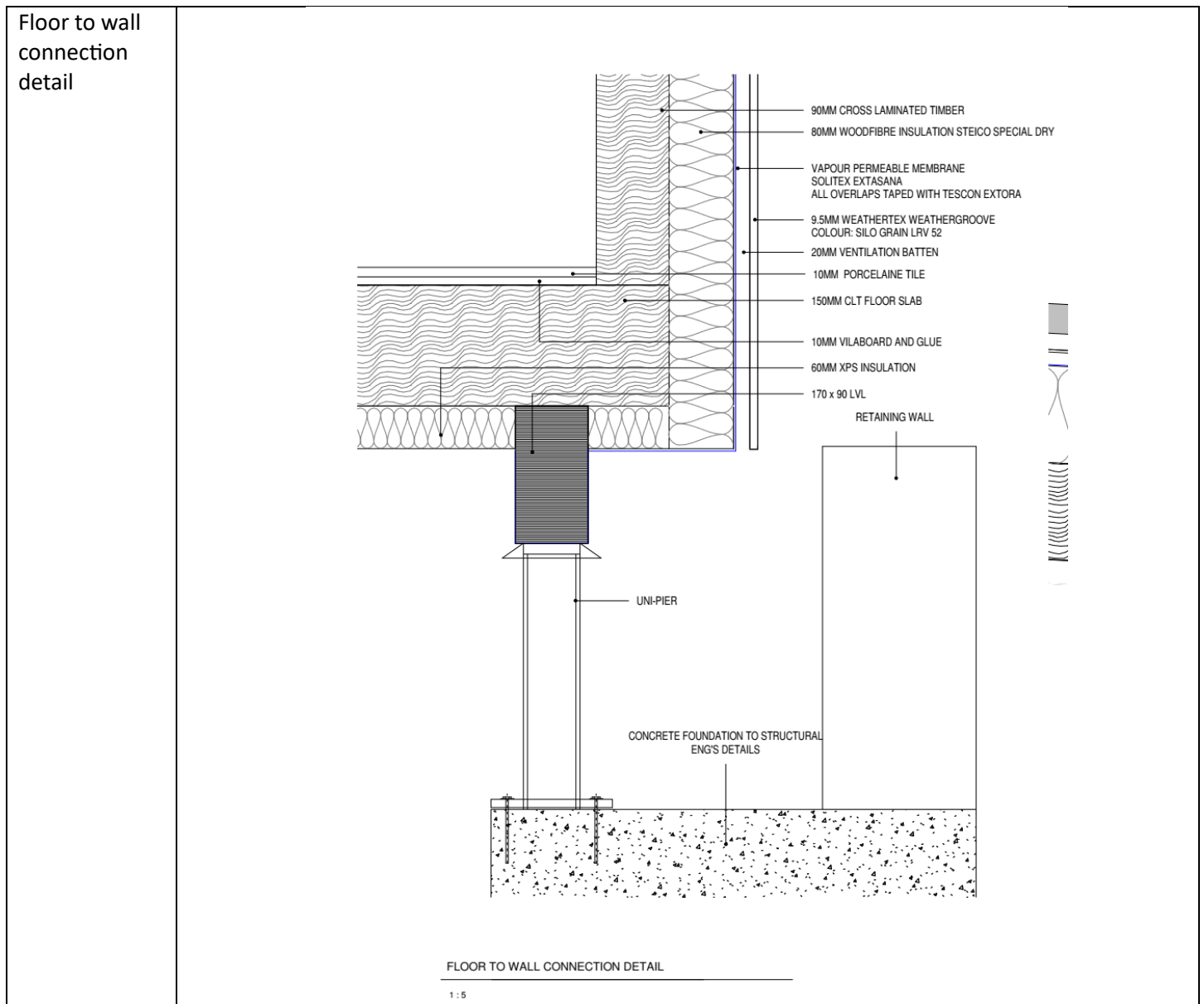
COLLAROY HOUSE	
HOT WATER SYSTEM	
Scale 1 : 100 A3	A 7.3

Construction of floor/ Bodenkonstruktion

The floor is suspended floor above a ventilated crawl space. The CLT floor panels are insulated by XPS board on the outside. The XPS board is then connect to the wall insulation at the perimeter.

Footings are to be position at the right position. The timber bearing sits across the footing. Then the floor CLT panels are placed on top of the timber bearing. The XPS boards were implemented to the CLT panels.

The gaps between the CLT panels were taped to ensure airtightness.



CLT floor panel

Viewed from
the ventilated
crawl space.



CLT floor panel
with XPS
insulation
board.

Viewed from
the ventilated
crawl space.

The
ventilation
ducts and
other building
services pipes



CLT wall panel
joining with
floor panel

The
connections
are taped to
minimize air
leakage



CLT floor panel connections to each other, are taped to minimize air leakage



CLT floor panel with XPS insulation board. The vapour permeable membrane is wrapped from the external wall to the XPS board

Viewed from the ventilated crawl space.



Crane lifts the CLT panels to position



CLT panels are joined with timber connectors and long screws.



Building services (pipes and electrical conduits) are installed at the CLT wall panel.

All the penetration are sealed and tapped to minimize air leakage.



Woodfibre insulation board goes onto the CLT panels with cut out for the building services.



Woodfibre insulation board goes onto the CLT panels with cut out for the building services.

Vapour permeable membrane wrap around the insulation layer.



The woodfibre boards are joined at the external corner with other board, to make sure the insulation layer is continuous and minimizes thermal bridge.



The penetration through the membranes are taped to minimize air leakage.



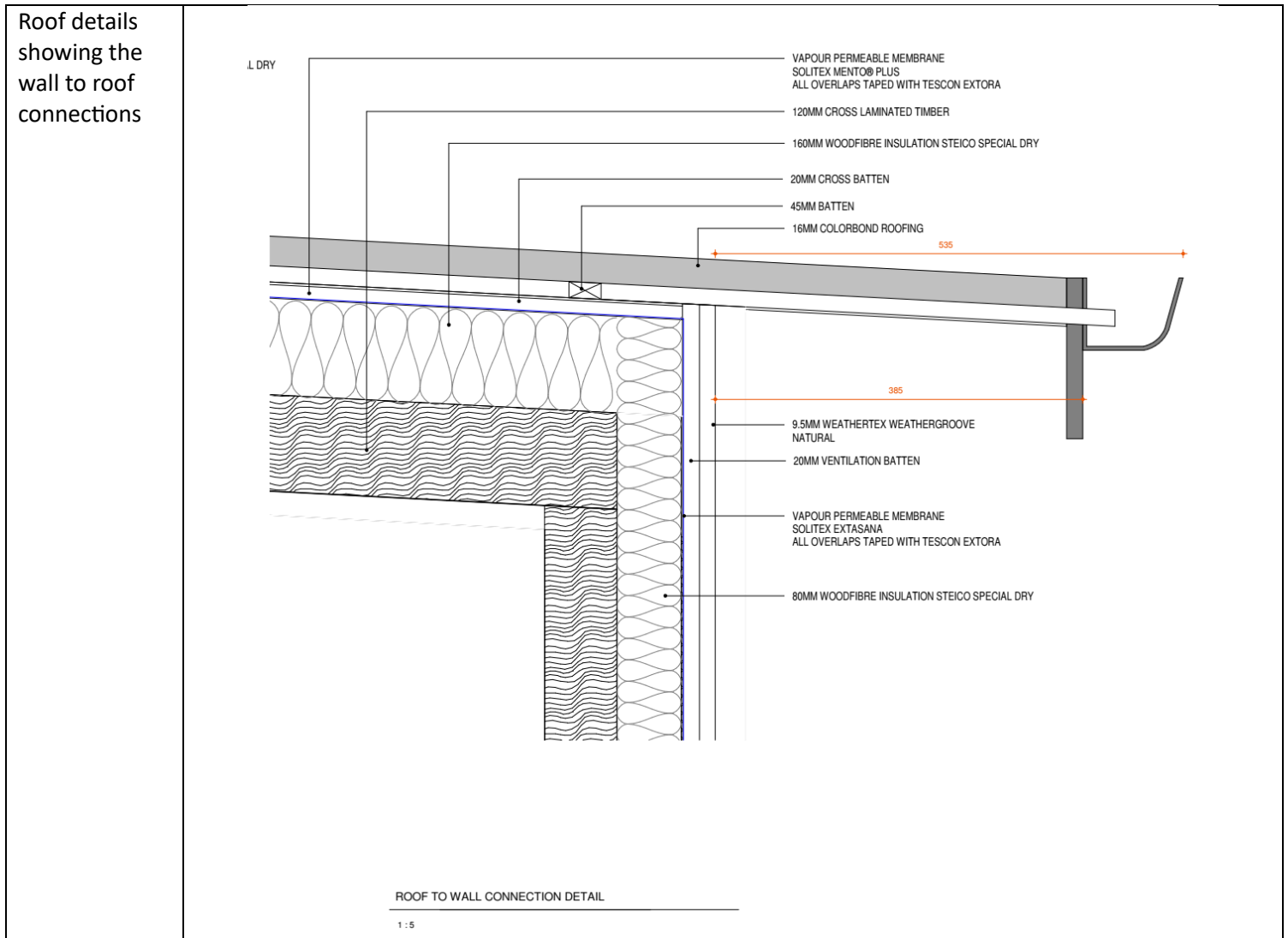
Construction of roof

The CLT panels are dropped into position by crane. The CLT panels joins with other CLT panels by timber connectors and long screws. The insulation layer continuous and wraps around the connections.

The CLT panel serves as structure of the roof and exposed to the interior. The CLT panel is insulated by the wood fibre board on the outside. The insulation layer wraps around the roof to wall joins. Then a vapour permeable membrane to protect the insulations and the CLT panels.

The building services, electrical and pipes are installed on the CLT panels, then the insulation goes on top. All the penetrations are sealed.

Batten and cross batters are installed above the membrane to support the metal roof sheet.



Crane lifts the
roof panels
onto position



The CLT panels connections are taped to minimize the air leakage.

It shows the roof and wall CLT connections.



The vapour permeable membrane wrap from the roof to wall.



The building services (conduits) are installed at the CLT panels. Then the woodfibre insulation installed on top with cut out for the building services.



Vapour permeable membrane wrap around the insulation. Then the batten and cross battens



The metal roof sheet then goes onto the battens.



Windows and installation

The windows and doors are premium triple glazed timber frame with aluminum cladding on the outside.


The windows and doors are Doepfner LAROS IV78 Timber-Aluminum Slim 1 Premium with spruce.

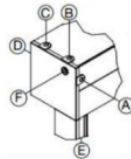
The average windows U value is $1.00 \text{ W}/(\text{m}^2\text{K})$ based on PHPP calculation. The detailed U_{frame} is as follows

The entry door D03 has overall $U_d=0.984\text{W}/(\text{m}^2\text{K})$.

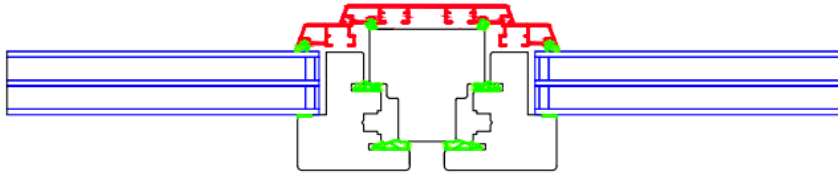
The majority of the glazing is Planiclear 6 mm Planitherm XNII/Planiclear 6mm/ Planiclear 6 mm Planitherm XNII with Argon(90%)/Air(10%) 16 mm in between. The U value is $0.573 \text{ W}/(\text{m}^2\text{K})$ and g value is 0.5193. Detailed glazing data sheet is as follow.

The windows are installed along the insulation layer to minimize the installation thermal bridge.

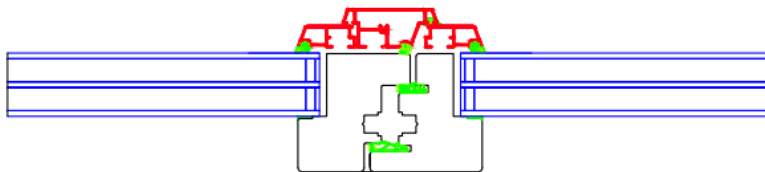
General Döpfner Window & Door Configuration	
Project details	
BAL Rating	Low
Wind rating	Max N2
Installation altitude	110m
Window specifications	
Timber	Spruce
Timber finish	HA0 - Natural finish
Glazing bead type	Type 3 (straight)
Aluminium Finish	RAL 7004PM ('signal grey', smooth, matte)
Profile system	IV78 Timber-Aluminium Slim1 Premium (image below not actual colours)
	
Timber overhang	Windows: 24mm all 4 sides. Main doors, turn doors, tilt&turn doors: 24mm jambs and top.
Rebates	Internal: Listed with each position where applicable External: 33x6 (WxD) for windows with premium external sill PQS
Handles	Lockable window handle, colour: titanium
Hinges	Listed with each position where applicable
Opening direction	All hinged units opening inwards, unless specified otherwise
U-value window (U_w)	Listed with each position where applicable
Weight	Calculated weight listed with each position. Actual weight might differ
Deviations	Listed with each position where applicable
Glazing specifications	
Glass description	Triple glazing with low-e coating on inside and outside pane. Inside pane toughened. Swisspacer Ultimate and Argon filled gaps.
Glass structure (from outside to inside)	3c 3 cT4 (c: low-e coating, T: toughened, L: laminated)
g-value glass (g_g)	0.54 (g-value for window g_w is lower than g_g due to frame contribution, g_w also referred to as 'Solar Heat Gain Coefficient', SHGC)
Visual Light Transmission glass (VLT _g)	74 %
U-value glass (U_g)	0.6 W/m ² K
Additional products	
Döpfner internal timber sills	None
Stemeseder external sill flashing	Type: PQS25. Length and depth shown for each window position.
Neher Flyscreens	All flyscreens with RAL 7004 (not seaside protected) powder-coated aluminium frame. Flyscreen and mesh type listed with each position.
Roma blinds and shutters	Shutter or blind type listed with each position.
Additional Information	
Additional information	---

General Roma Blind and Shutter Configuration	
Blind specifications	
Shutter or blind type	Venetian blind MODULO.P CDL
Head box	Venetian: Modulo.P 240 (Height: 240mm, Depth: 120mm) Maintenance access: NA
Rails	Rails type: Venetian CDL with light block: 53 mm x 69 mm Packer: None Bottom cut: Straight
Mounting holes on rails	Front (mounting on window)
Cable exit	Type: A (top of back plate) Side: Right hand side (view from inside) 
Drive type	Venetian: Elero JA Soft with Somfy Modulis Slim Receiver RTS (remote controlled)
Control	Venetian ModP CDL: Wall mounted remote control 1-channel Smoove 1 RTS Pure
Fabric type and colour	Venetian: CDL slats, colour: grey aluminium (code 303)
Headbox and rails colour	Venetian ModP CDL: RAL 7004 'signal grey' (not seaside protected)
Deviations	Listed with each position where applicable

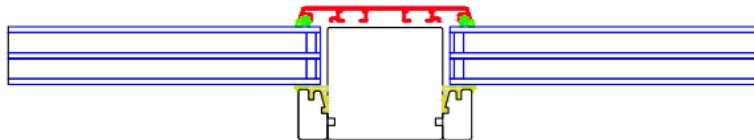
All calculations in accordance with EN ISO 10077-2



Mullion - Openable Sash to Openable Sash - Option 1 - Spruce			
Frame width (mm)	U value of frame U_f (W/(m ² K))	Ψ glass edge $\Psi_{\text{glass edge}}$ (W/(mK))	Temperature Factor $f_{Rsi-0.25}$
180	1.18	0.03	0.78




French - Openable Sash to Openable Sash - Option 2 - Spruce			
Frame width (mm)	U value of frame U_f (W/(m ² K))	Ψ glass edge $\Psi_{\text{glass edge}}$ (W/(mK))	Temperature Factor $f_{Rsi-0.25}$
128	1.11	0.03	0.79

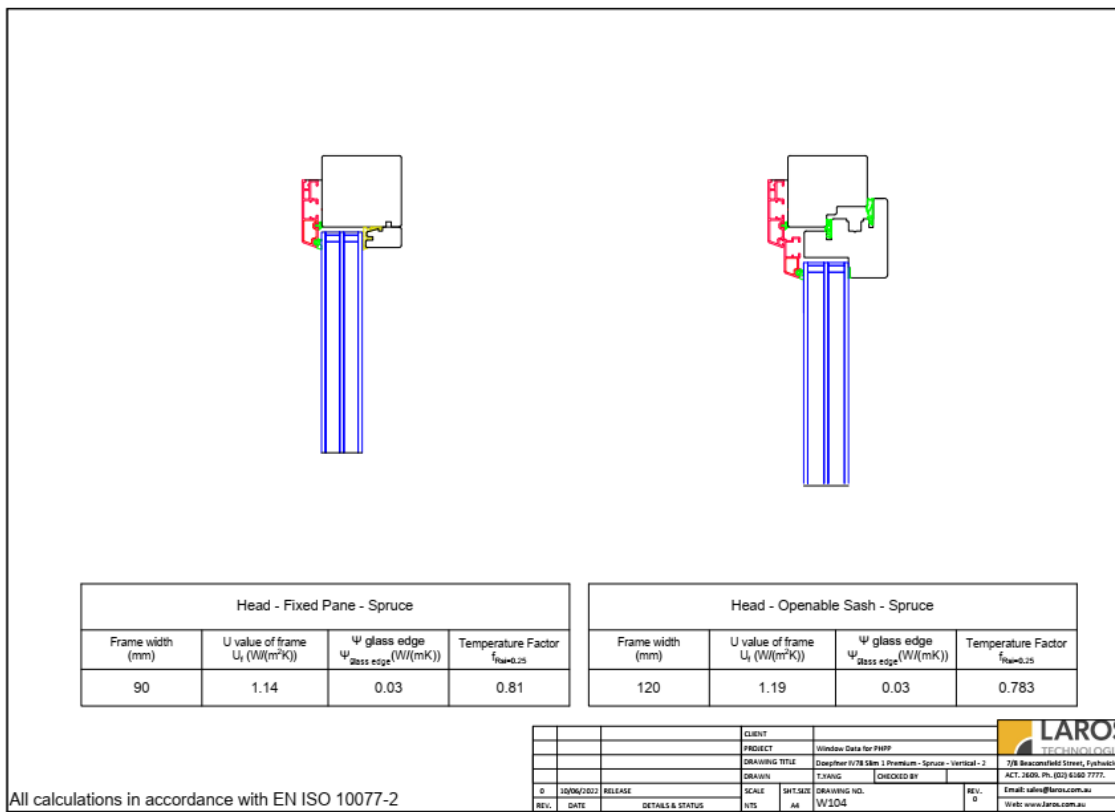
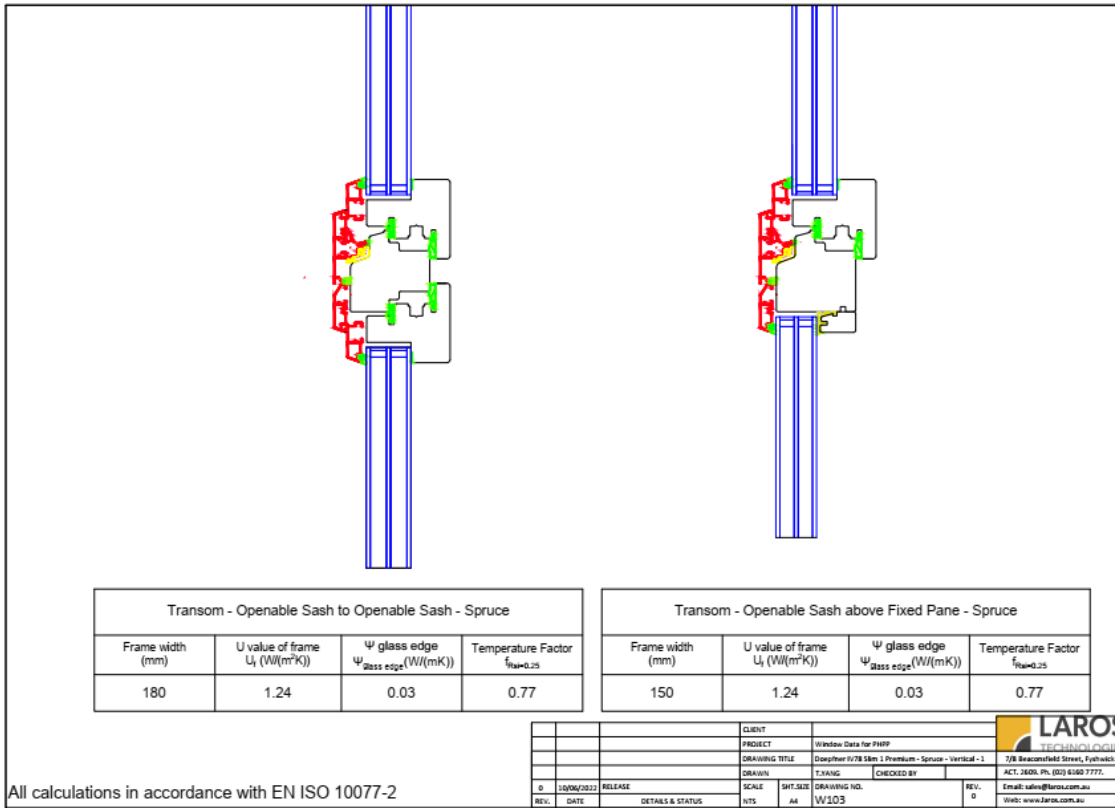


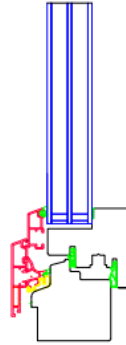
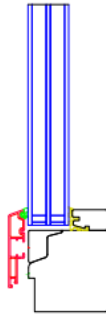
Mullion - Fixed Pane to Fixed Pane - Spruce			
Frame width (mm)	U value of frame U_f (W/(m ² K))	Ψ glass edge $\Psi_{\text{glass edge}}$ (W/(mK))	Temperature Factor $f_{Rsi-0.25}$
120	1.14	0.03	0.81

			CLIENT						
			PROJECT	Window Data for PHPP					
			DRAWING TITLE	Doepfner IV78 Slim 1 Premium - Spruce - Horizontal - 1					
			DRAWN	T.YANG	CHECKED BY				
			SCALE	SHT.SIZE	DRAWING NO.				
0	10/06/2022	RELEASE	NTS	A4	W101				
REV.	DATE	DETAILS & STATUS							



7/8 Beaconsfield Street, Fyshwick
ACT. 2609. Ph. (02) 6160 7777.
Email: sales@laros.com.au
Web: www.laros.com.au



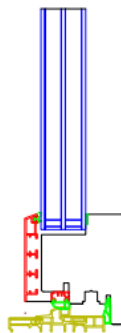
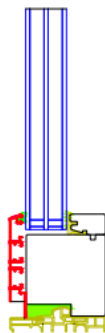


Sill- Fixed Pane - Spruce			
Frame width (mm)	U value of frame U_f (W/(m ² K))	Ψ glass edge $\Psi_{\text{glass edge}}$ (W/(mK))	Temperature Factor $f_{\text{tra}}=0.25$
100	1.24	0.03	0.784

Sill - Openable Sash - Spruce			
Frame width (mm)	U value of frame U_f (W/(m ² K))	Ψ glass edge $\Psi_{\text{glass edge}}$ (W/(mK))	Temperature Factor $f_{\text{tra}}=0.25$
130	1.28	0.03	0.773

		CLIENT			LAROS TECHNOLOGIES
		PROJECT	Window Data for PHPP		
		DRAWING TITLE	Door/finer 1/78 Slim 1 Premium - Spruce - Vertical - 3		7/8 Beaconfield Street, Yathukit
		DRAWN	T.FAUG	CHECKED BY	ACT. 2609, Ph. (02) 6160 7777.
0	10/06/2012	RELEASE	SCALE	DRAWING NO.	Email: sales@laros.com.au
REV.	DATE	DETAILS & STATUS	NTS	All	W105
					Web: www.laros.com.au

All calculations in accordance with EN ISO 10077-2



Door Sill - Fixed Pane - Spruce			
Frame width (mm)	U value of frame U_f (W/(m ² K))	Ψ glass edge $\Psi_{\text{glass edge}}$ (W/(mK))	Temperature Factor $f_{\text{tra}}=0.25$
115	1.38	0.03	0.79

Door Sill - Openable Sash - Spruce			
Frame width (mm)	U value of frame U_f (W/(m ² K))	Ψ glass edge $\Psi_{\text{glass edge}}$ (W/(mK))	Temperature Factor $f_{\text{tra}}=0.25$
115	1.54	0.03	0.741

		CLIENT			LAROS TECHNOLOGIES
		PROJECT	Window Data for PHPP		
		DRAWING TITLE	Door/finer 1/78 Slim 1 Premium - Spruce - Vertical - 4		7/8 Beaconfield Street, Yathukit
		DRAWN	T.FAUG	CHECKED BY	ACT. 2609, Ph. (02) 6160 7777.
0	10/06/2012	RELEASE	SCALE	DRAWING NO.	Email: sales@laros.com.au
REV.	DATE	DETAILS & STATUS	NTS	All	W106
					Web: www.laros.com.au

All calculations in accordance with EN ISO 10077-2



Pane 1	PLANICLEAR (4 mm) PLANITHERM XN II
Cavity 1	ARGON (90%) / AIR (10%) / 16 mm
Pane 2	SATINOVO MATE 4mm (3,9 mm)
Cavity 2	ARGON (90%) / AIR (10%) / 16 mm
Pane 3	PLANITHERM XN II PLANICLEAR (4 mm)

Pos 1 **N01**

Saint Gobain Glassolution Isolierglas-Center GmbH

Thomas Weller
Am Börstig 5
96052 Bamberg
Deutschland
0951/9641-237
thomas.weller@saint-gobain.com

	LUMINOUS FACTORS	CIE (15-2004)
	Light transmission (TL %)	71,4 %
	Outdoor reflection (RLe %)	14,2 %
	Indoor (RLi %)	14,2 %

	SOLAR FACTORS	EN410 (2011-04)
	Solar factor (g)	0,5266
	Shading Coefficient (SC)	0,6053

	COLOR RENDERING	CIE (15-2004)
	Transmission (Ra)	97,8
	Reflection (Ra)	94,5

	BURGLAR RESIST	EN356
	Result :	NPD

	CARBON FOOTPRINT	EN15804+A2
	Global warming potential 'GWP' N/A (A1-A3)	

	ENERGY FACTORS	EN410 (2011-04)
	Transmission (Te)	44,7 %
	Reflection (Ree)	29,7 %
	Indoor (Rei)	29,7 %
	Absorption (AE1)	14,2 %
	Absorption (AE2)	6,3 %
	Absorption (AE3)	5,1 %

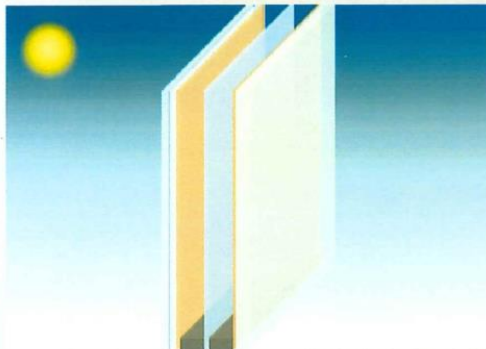
	THERMAL TRANSMISSION	EN673 (2011-04)
	Ug	0,575 W/m².K
	0° related to vertical position	

	MANUFACTURING SIZES	
	Nominal thickness	43,9 mm
	Weight	29,8 kg/m²

	PENDULUM RESISTANCE	EN12600
	Result :	NPD



Calumen III calculates the photometric characteristics and thermal transmission of glasses using calculation algorithms which comply with the following standards: the European standards EN 410 and EN 673, the international standard ISO9050, the Japanese standard JIS R 3106/3107 and the Korean standard KSL 2514/2525. The functional output and calculation rules of Calumen for standards EN 410 and EN 673 have been validated by TÜV Rheinland (report 89212153-01). The technical performances obtained according to these standards are provided for information only and are subject to amendment. Only the values entered in the performance declaration available on the CE marking site of Saint-Gobain Glass are official. The sound attenuation indices are measured under laboratory conditions according to the standards EN ISO 10140 and EN 12758. The calculated indices are provided for information only. The accuracy for Rw index lies within a range of +/-2dB. The glass thickness calculations comply with the 2012 version of the DTU39-P4 description. The USER is responsible for ensuring that the correct calculation hypotheses are entered and the DTU39 is applied appropriately for the project concerned.



Pane 1	PLANICLEAR (4 mm) PVB standard (2 x 0,38 mm) PLANICLEAR (4 mm) PLANITHERM XN
Cavity 1	ARGON (90%) / AIR (10%) / 14 mm
Pane 2	SATINOVO MATE 4mm (3,9 mm)
Cavity 2	ARGON (90%) / AIR (10%) / 14 mm
Pane 3	PLANITHERM XN II PLANICLEAR (8 mm)

Pos 2 **N02, N03**

Saint Gobain Glassolution Isolierglas-Center GmbH

Thomas Weller
Am Börstig 5
96052 Bamberg
Deutschland
0951/9641-237
thomas.weller@saint-gobain.com

LUMINOUS FACTORS CIE (15-2004)

Light transmission (TL %)	69,9 %
Outdoor reflection (RLe %)	14,0 %
Indoor (RLi %)	13,6 %

SOLAR FACTORS EN410 (2011-04)

Solar factor (g)	0,4756
Shading Coefficient (SC)	0,5466

COLOR RENDERING CIE (15-2004)

Transmission (Ra)	96,0
Reflection (Ra)	94,8

BURGLAR RESIST EN356

Result :	P2A/NPD/NPD
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CARBON FOOTPRINT EN15804+A2

Global warming potential 'GWP' N/A (A1-A3)	
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ENERGY FACTORS EN410 (2011-04)

Transmission (Te)	39,4 %
Reflection (Ree)	23,4 %
Indoor (Rei)	26,2 %
Absorption (AE1)	26,7 %
Absorption (AE2)	4,9 %
Absorption (AE3)	5,6 %

THERMAL TRANSMISSION EN673 (2011-04)

Ug	0,632 W/m².K
0° related to vertical position	

MANUFACTURING SIZES

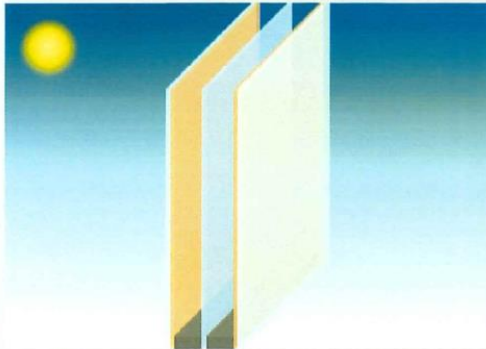
Nominal thickness	48,7 mm
Weight	50,6 kg/m²

PENDULUM RESISTANCE EN12600

Result :	1B1/NPD/NPD
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Calumen III calculates the photometric characteristics and thermal transmission of glass using calculation algorithms which comply with the following standards: the European standards EN 410 and EN 673, the international standard ISO9950, the Japanese standard JIS R 3106/3107 and the Korean standard KS L 2514/2525. The functional output and calculation rules of Calumen for standards EN 410 and EN 673 have been validated by TÜV Rheinland (report 89212153-01). The technical performances obtained according to these standards are provided for information only and are subject to amendment. Only the values entered in the performance declaration available on the CE marking site of Saint-Gobain Glass are official.
The sound attenuation indices are measured under laboratory conditions according to the standards EN ISO 10140 and EN 12759. The calculated indices are provided for information only. The accuracy for R_w index lies within a range of +/-2dB. The glass thickness calculations comply with the 2012 version of the DTU39-P4 description. The USER is responsible for ensuring that the correct calculation hypotheses are entered and the DTU39 is applied appropriately for the project concerned.



Pane 1	PLANICLEAR (3 mm) PLANITHERM XN
Cavity 1	ARGON (90%) / AIR (10%) / 16 mm
Pane 2	SATINOVO MATE 4mm (3,9 mm)
Cavity 2	ARGON (90%) / AIR (10%) / 16 mm
Pane 3	PLANITHERM XN PLANICLEAR (4 mm)

Pos 4, 8, 9 **N04, S08, S09**

Saint Gobain Glassolution Isollerglas-Center GmbH

Thomas Weller
Am Börstig 5
96052 Bamberg
Deutschland
0951/9641-237
thomas.weller@saint-gobain.com

LUMINOUS FACTORS CIE (15-2004)

Light transmission (TL %)	72,5 %
Outdoor reflection (RLe %)	14,2 %
Indoor (RLi %)	14,1 %

SOLAR FACTORS EN410 (2011-04)

Solar factor (g)	0,5303
Shading Coefficient (SC)	0,6095

COLOR RENDERING CIE (15-2004)

Transmission (Ra)	96,5
Reflection (Ra)	95,6

BURGLAR RESIST EN356

Result :	NPD
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CARBON FOOTPRINT EN15804+A2

Global warming potential 'GWP' N/A (A1-A3)	
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ENERGY FACTORS EN410 (2011-04)

Transmission (Te)	44,5 %
Reflection (Ree)	30,1 %
Indoor (Rei)	29,2 %
Absorption (AE1)	13,4 %
Absorption (AE2)	6,4 %
Absorption (AE3)	5,6 %

THERMAL TRANSMISSION EN673 (2011-04)

Ug	0,575 W/m².K
0° related to vertical position	

MANUFACTURING SIZES

Nominal thickness	42,9 mm
Weight	27,3 kg/m²

PENDULUM RESISTANCE EN12600

Result :	NPD
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Calumen III calculates the photometric characteristics and thermal transmission of glass using calculation algorithms which comply with the following standards: the European standards EN 410 and EN 673, the international standard ISO 9050, the Japanese standard JIS R 3106/3107 and the Korean standard KS L 2514/2525. The functional output and calculation rules of Calumen for standards EN 410 and EN 673 have been validated by TÜV Rheinland (report 89212153-01). The technical performances obtained according to these standards are provided for information only and are subject to amendment. Only the values entered in the performance declaration available on the CE marking site of Saint-Gobain Glass are official. The sound attenuation indices are measured under laboratory conditions according to the standards EN ISO 10140 and EN 12758. The calculated indices are provided for information only. The accuracy for Rw index lies within a range of +/-2dB. The glass thickness calculations comply with the 2012 version of the DTU39-P4 description. The USER is responsible for ensuring that the correct calculation hypotheses are entered and the DTU39 is applied appropriately for the project concerned.



Pane 1	PLANICLEAR (6 mm) PLANITHERM XN II
Cavity 1	ARGON (90%) / AIR (10%) / 16 mm
Pane 2	PLANICLEAR (6 mm)
Cavity 2	ARGON (90%) / AIR (10%) / 16 mm
Pane 3	PLANITHERM XN II PLANICLEAR (6 mm)

Pos 5, 12 **E05, N12, N13, N14, N15**

Saint Gobain Glassolution Isolierglas-Center GmbH

Thomas Weller
Am Börsting 5
96052 Bamberg
Deutschland
0951/9641-237
thomas.weller@saint-gobain.com

LUMINOUS FACTORS CIE (15-2004)

Light transmission (TL %)	71,2 %
Outdoor reflection (RLe %)	14,1 %
Indoor (RLi %)	14,1 %

SOLAR FACTORS EN410 (2011-04)

Solar factor (g)	0,5193
Shading Coefficient (SC)	0,5969

COLOR RENDERING CIE (15-2004)

Transmission (Ra)	96,9
Reflection (Ra)	93,5

BURGLAR RESIST EN356

Result :	NPD
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CARBON FOOTPRINT EN15804+A2

Global warming potential 'GWP' 72 Kg(CO ₂)/m ² (A1-A3)	
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ENERGY FACTORS EN410 (2011-04)

Transmission (Te)	43,8 %
Reflection (Ree)	28,4 %
Indoor (Rei)	28,4 %
Absorption (AE1)	17 %
Absorption (AE2)	5 %
Absorption (AE3)	5,8 %

THERMAL TRANSMISSION EN673 (2011-04)

Ug	0,573 W/m ² .K
0° related to vertical position	

MANUFACTURING SIZES

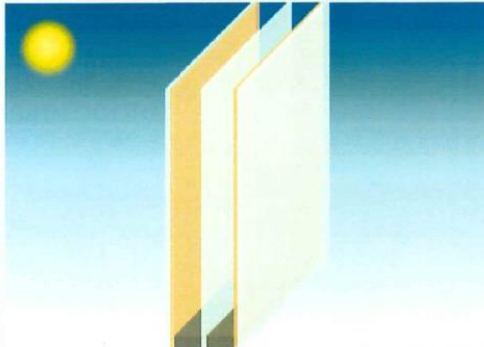
Nominal thickness	50,0 mm
Weight	45,0 kg/m ²

PENDULUM RESISTANCE EN12600

Result :	NPD
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Calumen III calculates the photometric characteristics and thermal transmission of glass using calculation algorithms which comply with the following standards: the European standards EN 410 and EN 673, the international standard ISO9050, the Japanese standard JIS R 3106/3107 and the Korean standard KS L 2514/2525. The functional output and calculation rules of Calumen for standards EN 410 and EN 673 have been validated by TÜV Rheinland (report 89212153-01). The technical performances obtained according to these standards are provided for information only and are subject to amendment. Only the values entered in the performance declaration available on the CE marking site of Saint-Gobain Glass are official. The sound attenuation indices are measured under laboratory conditions according to the standards EN ISO 10140 and EN 12758. The calculated indices are provided for information only. The accuracy for R_w index lies within a range of +/-2dB. The glass thickness calculations comply with the 2012 version of the DTU39-P4 description. The USER is responsible for ensuring that the correct calculation hypotheses are entered and the DTU39 is applied appropriately for the project concerned.



Pane 1	PLANICLEAR (3 mm) PLANITHERM XN
Cavity 1	ARGON (90%) / AIR (10%) / 16 mm
Pane 2	PLANICLEAR (3 mm)
Cavity 2	ARGON (90%) / AIR (10%) / 16 mm
Pane 3	PLANITHERM XN II PLANICLEAR (4 mm)

Pos 6, 11 **E06, W11**

Saint Gobain Glassolution Isolierglas-Center GmbH

Thomas Weller
Am Börstig 5
96052 Bamberg
Deutschland
0951/9641-237
thomas.weller@saint-gobain.com

LUMINOUS FACTORS CIE (15-2004)

Light transmission (TL %)	73,5 %
Outdoor reflection (RLe %)	14,7 %
Indoor (RLi %)	14,1 %

SOLAR FACTORS EN410 (2011-04)

Solar factor (g)	0,5349
Shading Coefficient (SC)	0,6149

COLOR RENDERING CIE (15-2004)

Transmission (Ra)	97,2
Reflection (Ra)	95,1

BURGLAR RESIST EN356

Result :	NPD
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CARBON FOOTPRINT EN15804+A2

Global warming potential 'GWP' 47 Kg(CO ₂)/m ² (A1-A3)	
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ENERGY FACTORS EN410 (2011-04)

Transmission (Te)	46,8 %
Reflection (Ree)	31,3 %
Indoor (Rei)	30,4 %
Absorption (AE1)	13,6 %
Absorption (AE2)	2,9 %
Absorption (AE3)	5,5 %

THERMAL TRANSMISSION EN673 (2011-04)

Ug	0,575 W/m ² .K
0° related to vertical position	

MANUFACTURING SIZES

Nominal thickness	42,0 mm
Weight	25,0 kg/m ²

PENDULUM RESISTANCE EN12600

Result :	NPD
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Calumen III calculates the photometric characteristics and thermal transmission of glass using calculation algorithms which comply with the following standards: the European standards EN 410 and EN 673, the international standard ISO9050, the Japanese standard JIS R 3106/3107 and the Korean standard KSL 2514/2525. The functional output and calculation rules of Calumen for standards EN 410 and EN 673 have been validated by TÜV Rheinland (report 89212153-01). The technical performances obtained according to these standards are provided for information only and are subject to amendment. Only the values entered in the performance declaration available on the CE marking site of Saint-Gobain Glass are official. The sound attenuation indices are measured under laboratory conditions according to the standards EN ISO 10140 and EN 12759. The calculated indices are provided for information only. The accuracy for R_w index lies within a range of +/-2dB. The glass thickness calculations comply with the 2012 version of the DTU39-P4 description. The USER is responsible for ensuring that the correct calculation hypotheses are entered and the DTU39 is applied appropriately for the project concerned.



Calumen III 1.25
Thursday, January 12, 2023



Pane 1	PLANICLEAR (3 mm) PLANITHERM XN
Cavity 1	ARGON (90%) / AIR (10%) / 16 mm
Pane 2	MONUMENTAL (4 mm)
Cavity 2	ARGON (90%) / AIR (10%) / 16 mm
Pane 3	PLANITHERM XN II PLANICLEAR (4 mm)

Pos 7 **S07**

Saint Gobain Glassolution Isolierglas-Center GmbH

Thomas Weller
Am Börstig 5
96052 Bamberg
Deutschland
0951/9641-237
thomas.weller@saint-gobain.com

LUMINOUS FACTORS CIE (15-2004)

Light transmission (TL %)	58,3 %
Outdoor reflection (RLe %)	12,4 %
Indoor (RLi %)	12,1 %

SOLAR FACTORS EN410 (2011-04)

Solar factor (g)	0,4671
Shading Coefficient (SC)	0,5369

COLOR RENDERING CIE (15-2004)

Transmission (Ra)	86,5
Reflection (Ra)	97,0

BURGLAR RESIST EN356

Result :	NPD
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CARBON FOOTPRINT EN15804+A2

Global warming potential 'GWP' N/A (A1-A3)	
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ENERGY FACTORS EN410 (2011-04)

Transmission (Te)	31,7 %
Reflection (Ree)	27,5 %
Indoor (Rei)	26,6 %
Absorption (AE1)	13,1 %
Absorption (AE2)	24,3 %
Absorption (AE3)	3,5 %

THERMAL TRANSMISSION EN673 (2011-04)

Ug	0,575 W/m².K
0° related to vertical position	

MANUFACTURING SIZES

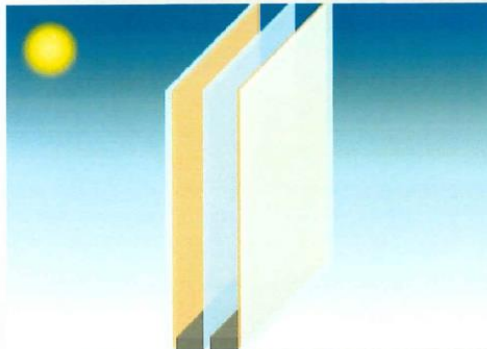
Nominal thickness	43,0 mm
Weight	27,5 kg/m²

PENDULUM RESISTANCE EN12600

Result :	NPD
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Calumen III calculates the photometric characteristics and thermal transmission of glass using calculation algorithms which comply with the following standards: the European standards EN 410 and EN 673, the international standard ISO9050, the Japanese standard JIS R-3106/3107 and the Korean standard KS L 2514/2525. The functional output and calculation rules of Calumen for standards EN 410 and EN 673 have been validated by TDV Rheinland (report 99212153/01). The technical performances obtained according to these standards are provided for information only and are subject to amendment. Only the values entered in the performance declaration available on the CE marking site of Saint-Gobain Glass are official. The sound attenuation indices are measured under laboratory conditions according to the standards EN ISO 10140 and EN 12758. The calculated indices are provided for information only. The accuracy for Rv index lies within a range of +/-2dB. The glass thickness calculations comply with the 2012 version of the DTU39-P4 description. The USER is responsible for ensuring that the correct calculation hypotheses are entered and the DTU39 is applied appropriately for the project concerned.



Pane 1	PLANICLEAR (4 mm) PLANITHERM XN II
Cavity 1	ARGON (90%) / AIR (10%) / 16 mm
Pane 2	MONUMENTAL (4 mm)
Cavity 2	ARGON (90%) / AIR (10%) / 16 mm
Pane 3	PLANITHERM XN II PLANICLEAR (4 mm)

Pos 21, 23 **D01, D03**

Saint Gobain Glassolution Isolierglas-Center GmbH

Thomas Weller
Am Börstig 5
96052 Bamberg
Deutschland
0951/9641-237
thomas.weller@saint-gobain.com

LUMINOUS FACTORS CIE (15-2004)

Light transmission (TL %)	57,7 %
Outdoor reflection (RLe %)	12,2 %
Indoor (RLi %)	12,2 %

SOLAR FACTORS EN410 (2011-04)

Solar factor (g)	0,4669
Shading Coefficient (SC)	0,5367

COLOR RENDERING CIE (15-2004)

Transmission (Ra)	86,2
Reflection (Ra)	97,4

BURGLAR RESIST EN356

Result :	NPD
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CARBON FOOTPRINT EN15804+A2

Global warming potential 'GWP' N/A (A1-A3)	
--	--

ENERGY FACTORS EN410 (2011-04)

Transmission (Te)	31,7 %
Reflection (Ree)	26,8 %
Indoor (Rei)	26,8 %
Absorption (AE1)	13,8 %
Absorption (AE2)	24,2 %
Absorption (AE3)	3,5 %

THERMAL TRANSMISSION EN673 (2011-04)

Ug	0,575 W/m².K
0° related to vertical position	

MANUFACTURING SIZES

Nominal thickness	44,0 mm
Weight	30,0 kg/m²

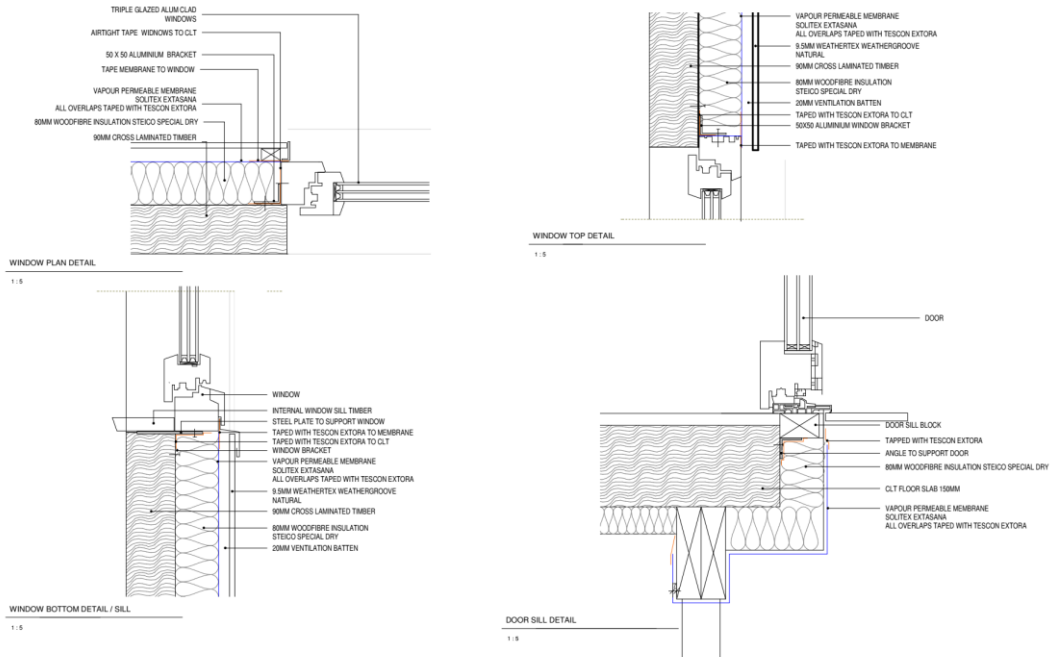
PENDULUM RESISTANCE EN12600

Result :	NPD
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Calumen III calculates the photometric characteristics and thermal transmission of glass using calculation algorithms which comply with the following standards: the European standards EN 410 and EN 673, the international standard ISO9890, the Japanese standard JIS R 3106/3107 and the Korean standard KSL 2514/2525. The functional output and calculation rules of Calumen for standards EN 410 and EN 673 have been validated by TÜV Rheinland (report 89212153-01). The technical performances obtained according to these standards are provided for information only and are subject to amendment. Only the values entered in the performance declaration available on the CE marking site of Saint-Gobain Glass are official. The sound attenuation indices are measured under laboratory conditions according to the standards EN ISO 10140 and EN 12758. The calculated indices are provided for information only. The accuracy for Rw index lies within a range of +/-2dB. The glass thickness calculations comply with the 2012 version of the DTU39-P4 description. The USER is responsible for ensuring that the correct calculation hypotheses are entered and the DTU39 is applied appropriately for the project concerned.

Windows and door installation details.



Do not scale from plans. All dimensions and levels shown on plan are subject to confirmation on site.

Building Designer	SAMUELA MADEJ-MURPHY
Address	PO Box 251 Church Point NSW 2105
Contact	E: samuelam@thairmail.com P: 0450 331 573

Compliance	Figured dimensions take precedence over scale. Do not scale from drawings. All building work to comply with NCC, Australian Standards and all relevant authorities. All structural requirements to be met as per structural engineer's drawings and details. Verify all dimensions on site. Report all discrepancies to designer.
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Date	21.03.23	Description	CONSTRUCTION SET
	06.03.24		FINAL IDENTIFICATION SET

Client	Jenny & Geoff Koo
Address	28 Stella St Coffey Plains

COLLAPSE HOUSE	
EXTERNAL DETAILS 2	
Scale	1:5 A3
A 5.4	

Windows installed at the CLT wall panel. The connections are taped to minimize air leakage.



The window sill connection to the CLT panels is also tapped on the inside.



Woodfibre insulation goes around the window. So windows are installed aligned with the insulation layer.



Expanding foam is filled in the gap between the window and woodfibre board.



The window frame is taped to the vapour permeable membrane.



Building airtight envelope

The airtight envelope consists of the following layers:

- The floor, wall and roof CLT panels are the main airtight layer. The gaps between panels, all penetrations are sealed and taped to minimize air leakage.
- Vapour permeable membrane warped around the CLT wall, roof panels provide another airtight layer.

The airtight blower door test results are:

Air flow	Measurement	Result
	Building volume	405.12m ³
Pressurisation	q50 (Airflow)	50m ³ /h
	n50 ACH	0.12
Depressurisation	q50 (Airflow)	50m ³ /h
	n50 ACH	0.12
Average Result	n50 ACH	0.12



Layout of the ventilation system ducting

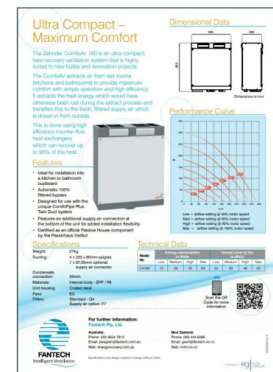
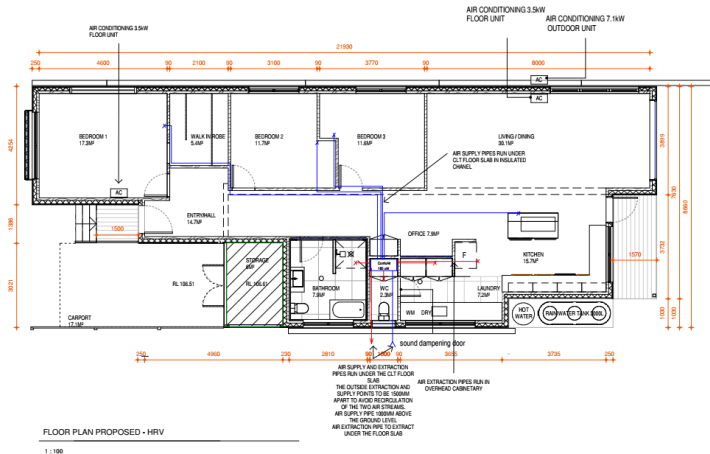
In this project a ducted Zehnder Comfo Air 180 to be installed with 2 silencers (ZENACWS-220 Attenuator CW-S 220). The air supply for the internal spaces (3 bedrooms, walk in robe and living area) is to be ducted by running the pipes (ComfoTube DN90) under the CLT floor slab in an insulated (60 XPS) boxed channel. The pipes will enter each room through the floor with vent locations:

- Bedroom 1, 2 & 3: 2200mm above floor level in the walls
- Living area – in the kickboard of the kitchen island (all shown on the HRV layout)

The external air intake and exhaust air outlet to be run under the CLT floor slab & the XPS insulation layer (outside the thermal envelope) as shown on the HRV layout. The pipes are DN125 Rigid EPP Duct, spec sheet for those insulated ducts attached.

The air supply and exhaust are located in the kickboards of the kitchen island.

Ventilation ducting layout shows the ducting and vents.



Do not scale from plans. All dimensions and levels shown on plan are subject to confirmation on site.							
Building Designer	SAMUELA MADEJ-MURPHY	Compliance	Figure dimensions take precedence over scale. Do not scale from drawings. All building work to comply with NCC, Australian Standards and all relevant authorities. All structural requirements to be met as per structural engineer's drawings and details. Verify all dimensions on site. Report all discrepancies to designer.	Copyright	Copyright and drawings are the property of the designer Samuela Madej-Murphy. This document may only be used for the express purpose and project for which it has been created and delivered. This document may not be otherwise used or copied.	Date	22.03.23
Address	PO Box 253 Church Point NSW 2195	Description	CONSTRUCTION SET	Client	Jenny & Geoff Kiv	COLLAROY HOUSE	
Contact	S. samuelam@fintech.com P: 0450 321 575	Date	06.03.24	Address	39 Sheila St Collaroy Plateau	Scale	As Indicated
						PHI CERTIFICATION SET	A 3.3

The ventilation unit with duct runs around it.



Wall mount
vent ducting



Wall mount
vent ducting



Insulated
ventilation
duct.



Wall mount
vent



Wall mount
vent



Floor vent at
the kitchen.



Insulated ventilation ducts running under the floor outside of the thermal envelope.



External ventilation main exhaust vent grill under the floor.



External
ventilation
main supply
vent grill next
to the wall
from floor.



Ventilation unit

The ventilation units used for this project is a ducted Zehnder Comfo Air 180. It is a heat recovery ventilation system. The effective heat recovery is 82%. The specific power input is 0.27 Wh/m³.

Ventilation
unit installed.



Heating and cooling supply/ Wärme- und Kälteversorgung

The air conditioning unit 2 (2x 3.5kW MFZ-KW35CG-A1) are to be located under the CLT floor slab and XPS insulation (outside the thermal envelope). All the penetration points to be sealed with tapes.

Reverse cycle air conditioning is installed.

The air conditioning 7.1 kW outdoor unit is located at the external side of the living/dining room.

The air conditioning 3.5 kW indoor floor units are located at bedroom 1 and living/dining room.

Air conditioning system floor unit in the living.



Air conditioning system floor unit in bedroom 1.



Air conditioning outdoor unit.



The hot water system - Rheem Stellar 160 litre Stainless Steel model 4A1160 tank (specs attached) to be located outside the thermal envelope of the house as per the plans. All penetration point for the hot water plumbing are to be sealed with tapes. There will be 5 hot water taps, see the attached layout. The pipes will run from under the floor up on the walls to connect to the taps.

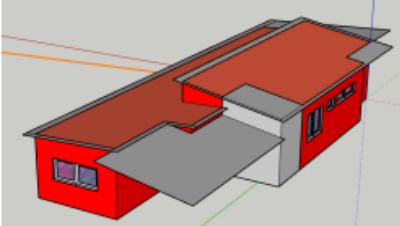
Domestic hot water system



PHPP-Results/ PHPP-Ergebnisse

Passive House-Verification

10.3 EN



Building:	House
Street:	39 Stella St
Postcode/City:	2097 Collaroy Plateau
Province/Country:	NSW AU-Australia
Building type:	1-Freestanding single family house
Climate data set:	AU1010a-Terrey Hills, Altitude corrected
Climate zone:	5: Warm
Altitude of location:	107 m
Home owner / Client:	
Street:	39 Stella St
Postcode/City:	2097 Collaroy Plateau
Province/Country:	NSW AU-Australia
Mechanical engineer:	Conor Murphy
Street:	65 Richard Road
Postcode/City:	2105 Scotland Island
Province/Country:	NSW AU-Australia
Certification:	Detail Green
Street:	18 Fletcher Road
Postcode/City:	3747 Beechworth
Province/Country:	VIC AU-Australia

Architecture:	Samuela Madej-Murphy
Street:	65 Richard Road
Postcode/City:	2105 Scotland Island
Province/Country:	NSW AU-Australia
Energy consultancy:	Laros Consulting
Street:	7/8 Beaconsfield Street
Postcode/City:	2609 Fyshwick
Province/Country:	ACT AU-Australia
Year of construction:	2023
No. of dwelling units:	1
No. of occupants:	2.8
Interior temperature winter [°C]:	20.0
Interior temp. summer [°C]:	25.0
Internal heat gains (IHG) winter [W/m²]:	2.5
IHG summer [W/m²]:	2.5
Specific heat capacity [Wh/K per m² TFA]:	80
Mechanical cooling:	x

Specific building characteristics with reference to the treated floor area				Alternative criteria		Fullfilled?²
	Treated floor area m²			Criteria	Alternative criteria	
Space heating	Heating demand kWh/(m²a)	8	≤	15	-	Yes
	Heating load W/m²	9	≤	-	10	
Space cooling	Cooling & dehum. demand kWh/(m²a)	10	≤	18		Yes
	Frequency of overheating (> 25 °C) %	-	≤	-		-
	Frequency of excessively high humidity (> 12 g/kg) %	0	≤	10		Yes
Airtightness	Pressurisation test result n ₅₀ 1/h	0.1	≤	0.6		Yes
Non-renewable Primary Energy (PE)	PE demand kWh/(m²a)	158	≤	-		-
Primary Energy Renewable (PER)	PER demand kWh/(m²a)	69	≤	60	69	Yes
	Generation of renewable energy (in relation to projected building) kWh/(m²a)	93	≥	-	8	

I confirm that the values given here 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 Classic?	Yes
2-Certification	Emilia	Iacovino	Signature:	
Certificate-ID	45122_DGREEN_PH_20241015_EI	Issued on:	16/10/24	City:
			Beechworth	

Project data imported from designPH 2.1.10 2022-11-18 12:02:25 +1100

PHPP, Verification

LAROS_-_Geoff_Krix_-_Collaroy_Plateau_-_PHPP_-_C2252-_v5 certifier printed

Page 71 | 72

Certification/Zertifizierung

Certificate

Certified Passive House Classic



18 Fletcher Road
3747 Beechworth VIC
Australia

Authorised
by:



Dr. Wolfgang Feist
64283 Darmstadt
Germany

House

39 Stella St, 2097 Collaroy Plateau, Australia



Client	39 Stella St 2097 Collaroy Plateau, Australia
Architect	Samuela Madej-Murphy 65 Richard Road 2015 Scotland Island, Australia
Builder	Conor Murphy 65 Richard Road 2015 Scotland Island, Australia
Energy	Laros Consulting 7/8 Beaconsfield Street 2609 Fyshwick, Australia


Passive House buildings offer excellent thermal comfort and very good air quality all year round. Due to their high energy efficiency, energy costs as well as greenhouse gas emissions are extremely low.

The design of the above-mentioned building meets the criteria defined by the Passive House Institute for the 'Passive House Classic' standard:

Building quality		This building	Criteria	Alternative criteria
Heating	Heating demand [kWh/(m ² a)]	8	≤ 15	-
	Heating load [W/m ²]	9	≤ -	10
Cooling	Cooling + dehumidification demand [kWh/(m ² a)]	10	≤ 18	
Airtightness	Pressurization test result (n ₅₀) [1/h]	0.1	≤ 0.6	
Renewable primary energy (PER)	PER-demand [kWh/(m ² a)]	69	≤ 60	69
	Generation (reference to ground area) [kWh/(m ² a)]	93	≥ -	8

The associated certification booklet contains more characteristic values for this building.

Beechworth
16/10/2024


Certifier: Emilia Iacovino, Detail Green