



Single-storey, single family home in Saanich, BC

1.1 Data of building

Year of construction	2022		
U-value external wall	0,073 W/(m ² K)	Space heating requirement	14 kWh/(m ² a)
U-value basement	0,056 W/(m ² K)	Primary Energy Renewable (PER)	53 kWh/(m ² a)
U-value roof	0,051 W/(m ² K)	Generation of renewable Energy	107 kWh/(m ² a)
U-value window	0,82 W/(m ² K)	Non-renewable Primary Energy (PE)	54 kWh/(m ² a)
Heat recovery	89 %	Pressurization test n ₅₀	-1 0,6 h
Special features	On-site photovoltaic panels, gabion walls at north and east facades. Interior designed to enable ageing in place and is appropriate for the sight-impaired owner.		

1.2 Brief Description

Gabion Passive House

This single storey, single family home in Saanich, BC was built for the retired owners with intent to age in place and provide a comfortable home for 1 of the sight-impaired occupants. The project design strategy was focused working with the local environment on features site-sourced rocks for its defining gabion wall structures and was built with strong seismic and weather resilience in mind. The building structure includes a large south facing patio built around a Garry Oak tree and above the existing rock outcrops with the south building wing cantilevered over the meadow space to the south.

The project is also pursuing “Living Building Challenge Petal” certification and was recognized with a technical award from the Sustainable Architecture & Building Magazine. Photovoltaic energy generation, electricity storage devices, and on-site water supply contribute to the building’s resilient design.

1.3 Responsible project participants

Architect	Graeme Verhulst, Waymark Architecture waymarkarchitecture.com
Passive House project planning	Danny Taylor, Focal Engineering focaleng.com
Construction management	Rob McElroy, Interactive Construction interactiveconstructon.ca
Certifying body	
Steve Mann, Home Energy Services Green-mann.com	
Certification ID	
37816_HES_PH_20230201_SM	7149 (www.passivehouse-database.org)

Author of project documentation

Focal Engineering www.focaleng.com	
Date	Signature
Jan 31, 2025	

2. Overview photos



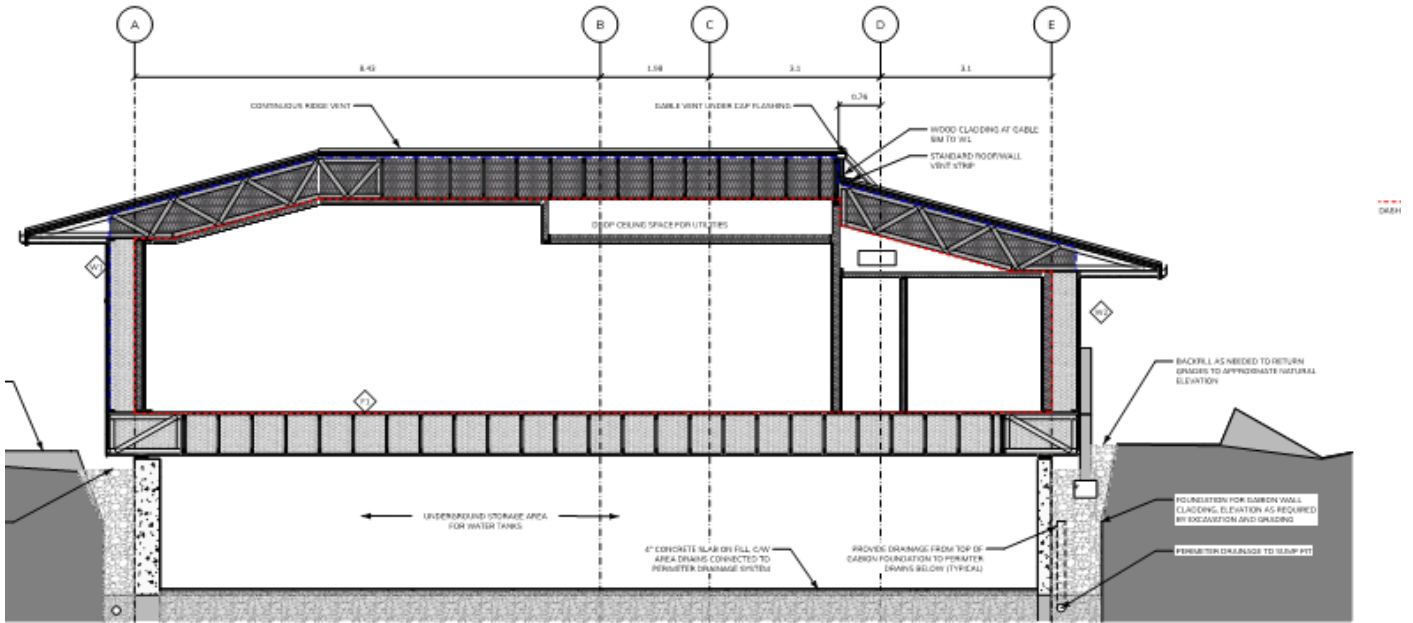
Patio deck and unfinished yard to southwest of building, including retained central Garry Oak tree.

Interior photo example

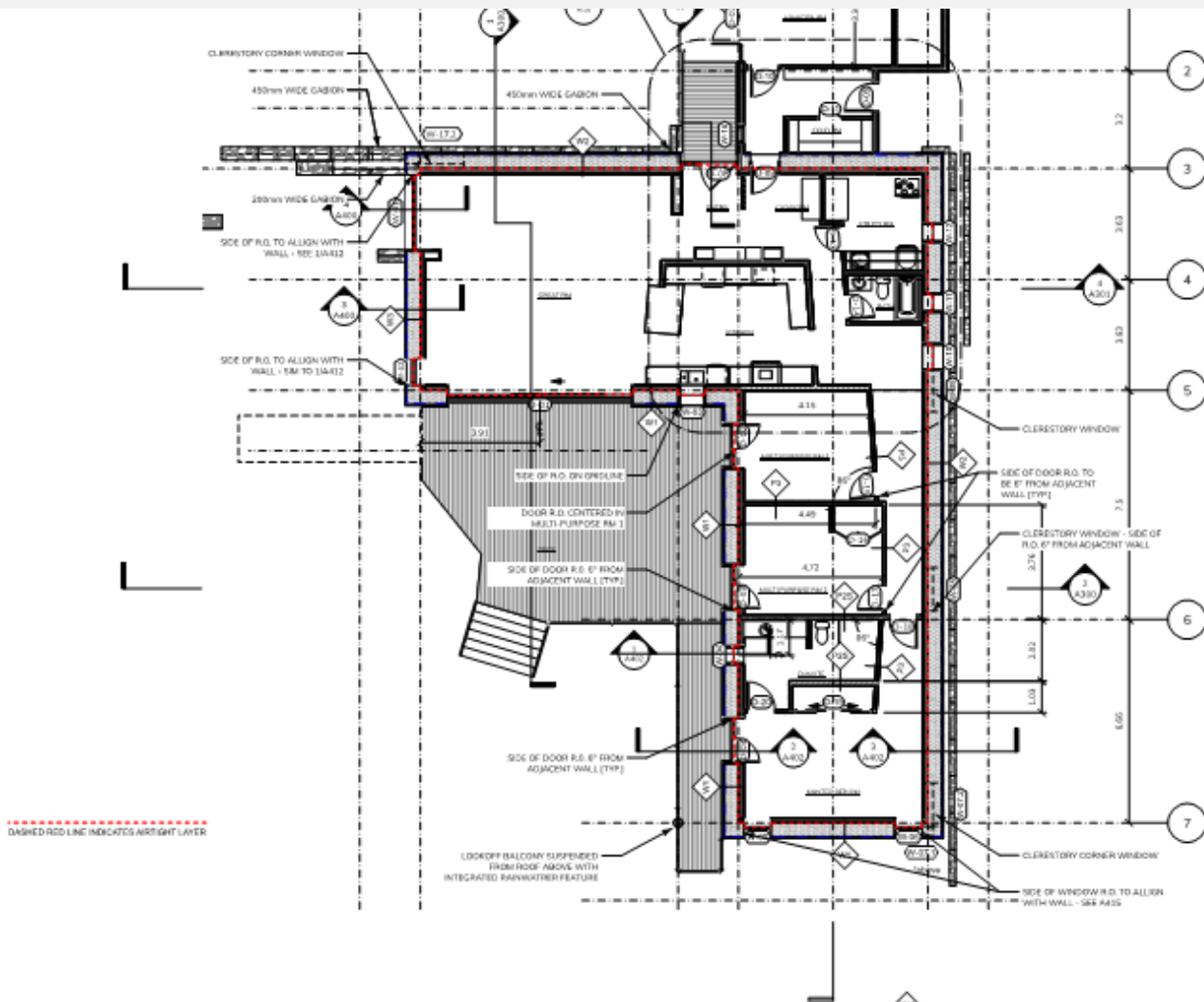


Central great room with access from kitchen and main entrance, sliding patio door to south.

3. Sectional drawing

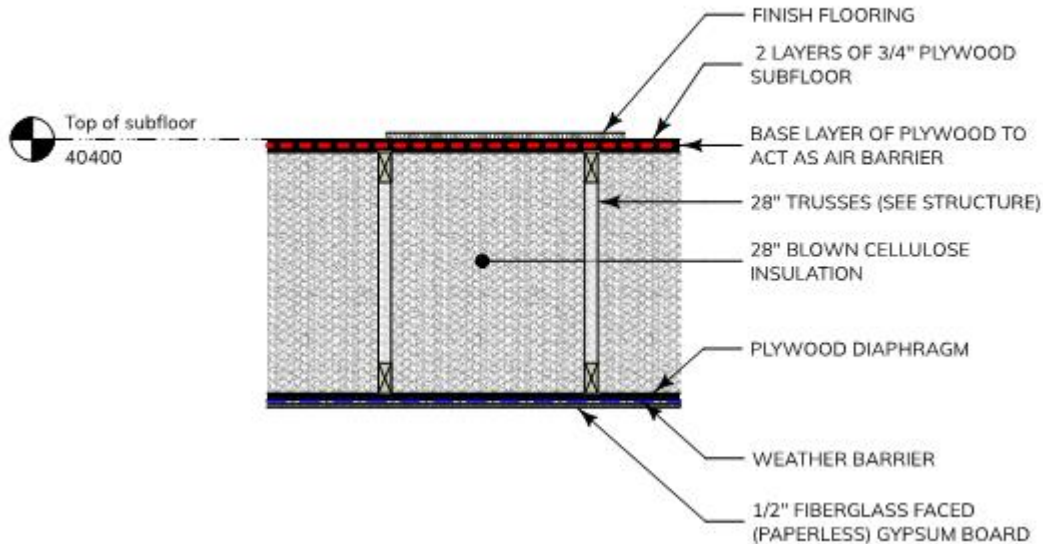


4. Floor plans



5. Envelope Details

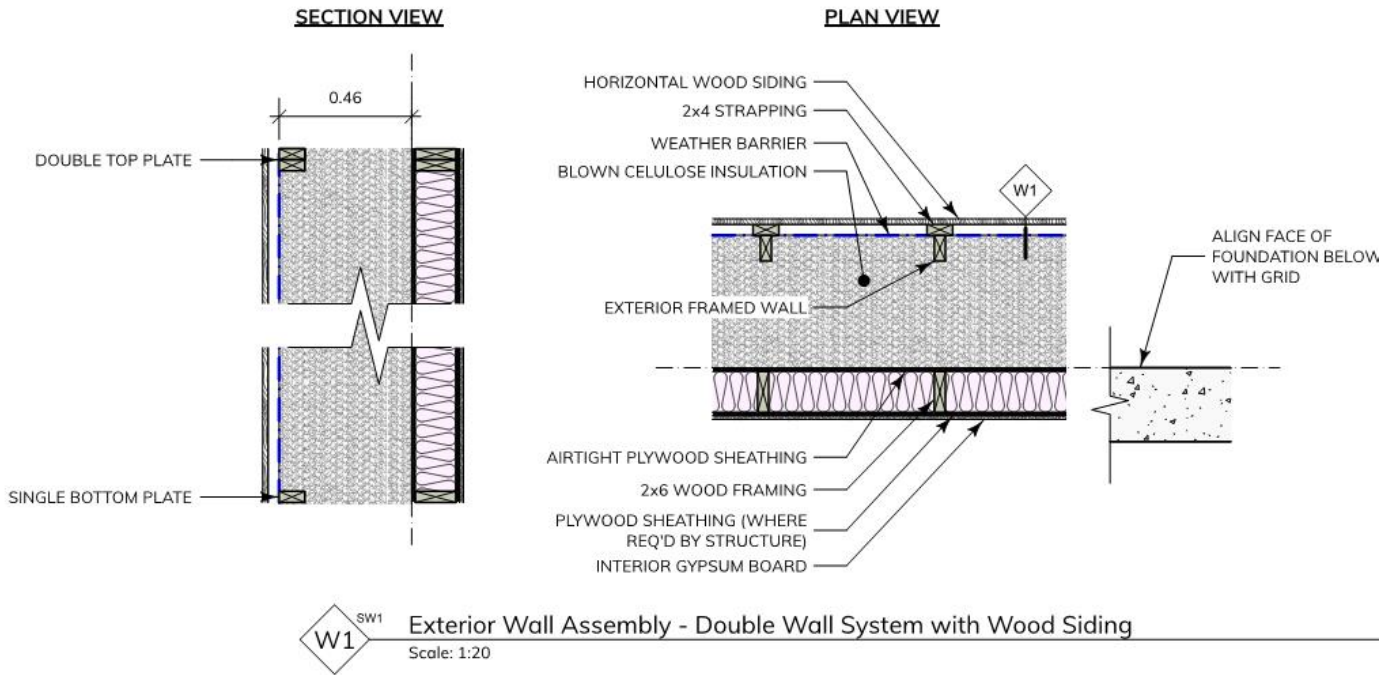
5.1 Floor construction



As a single storey building with a large cantilevered section above grade, a high depth of insulation was required for the floor assembly.

Assembly no.		05ud			F1 - Truss Floor (over exterior) (page A601)		Interior insulation?	
Orientation of building element		3-Floor		Heat transmission resistance [m ² K/W]				
Adjacent to		1-Outdoor air		interior R _{si}		0.17		
				exterior R _{se}		0.04		
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]		
Floor finish - hardwood	0.180							
Plywood 3/4"	0.130					19		
Ins. - blown cellulose	0.039	Soft-wood I-Joists @ 24"oc- Horiz. chord	0.130			89		
Ins. - blown cellulose	0.039					533		
Ins. - blown cellulose	0.039	Soft-wood I-Joists @ 24"oc- Horiz. chord	0.130			89		
Plywood 3/4"	0.130					19		
Gypsum Board	0.250					13		
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total		
90%		10.0%				76.2 cm		
U-value supplement				U-value:		0.055 W/(m ² K)		
						Rip-103.17		

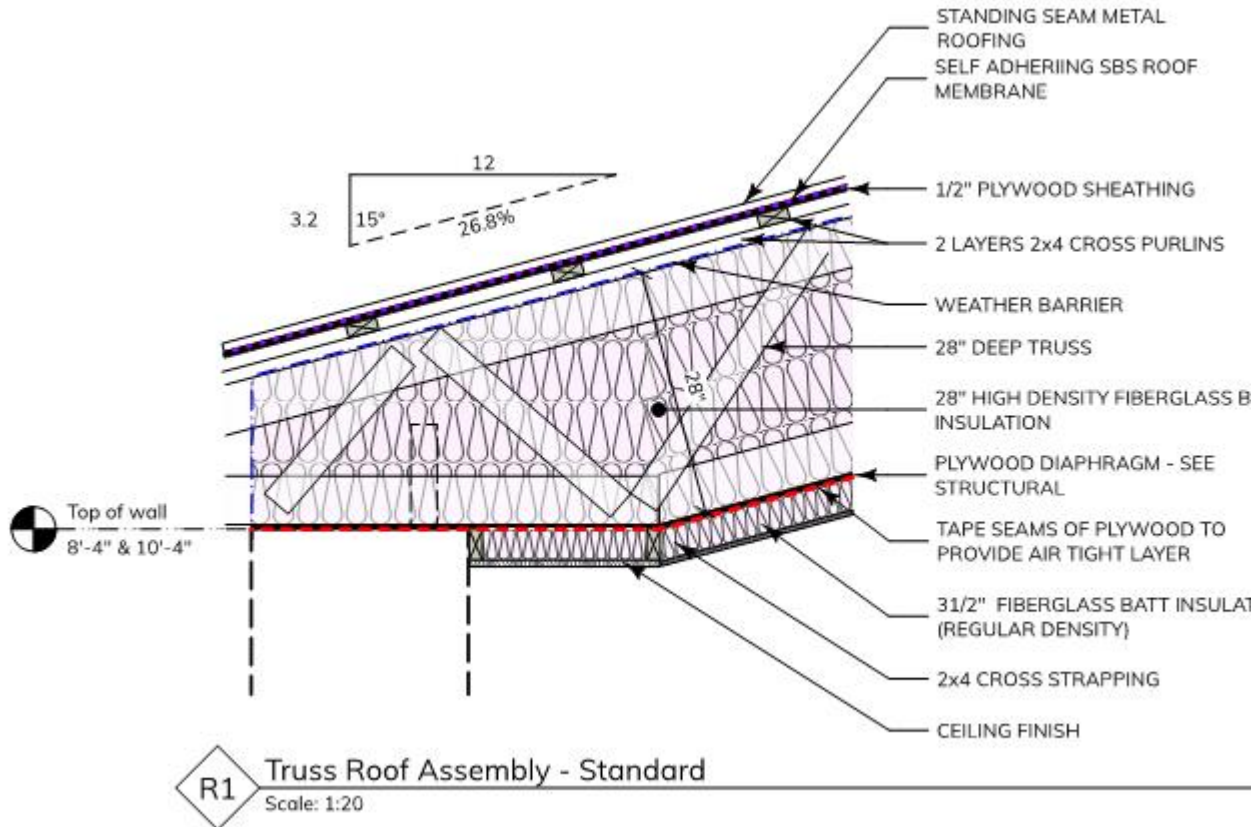
5.2 External wall construction



A masonry sand-lime brick wall (usually 17.5 cm thick) is plastered with gypsum plaster on the inside. On the outside, a two-layer thermal insulation composite system with an insulation thickness of 275 mm is applied, with a mineral plaster finish on the outside.

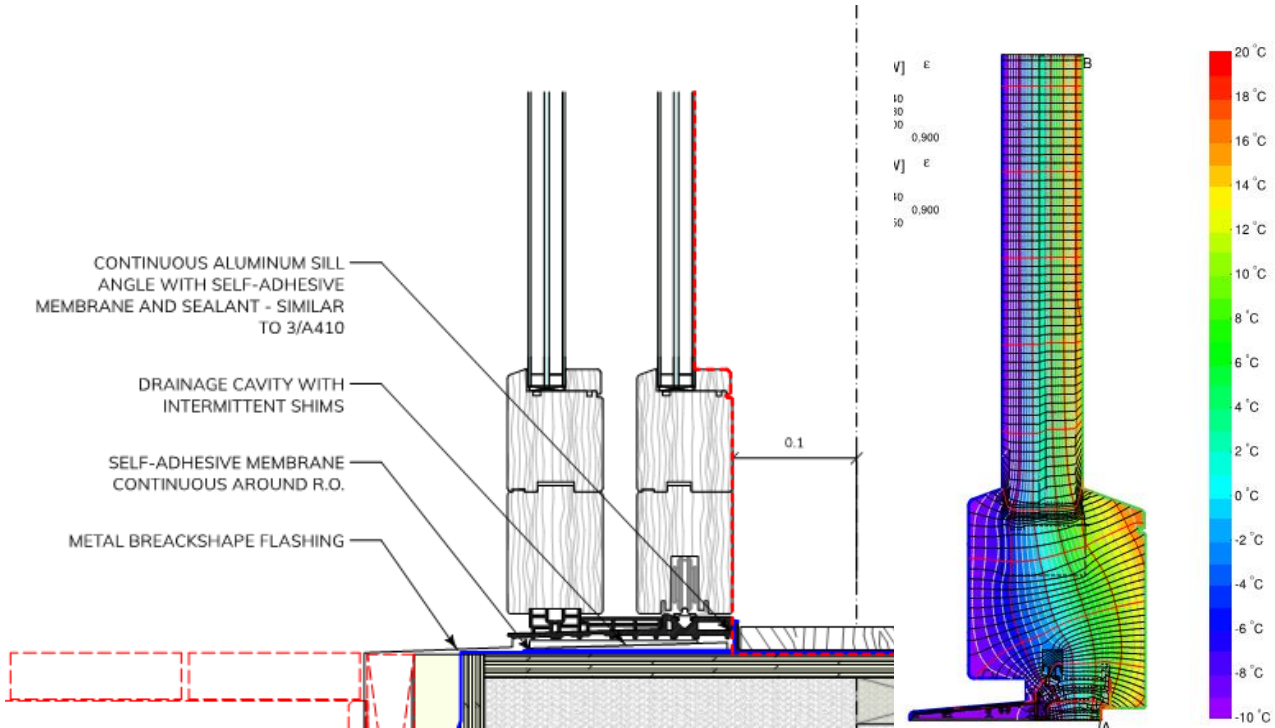
Assembly no.		10ud				W1 - Double Wall System with Wood Siding (A600)		Interior insulation?	
Orientation of building element		2-Wall		Heat transmission resistance [m ² K/W]		interior R _{si}		0.13	
Adjacent to		3-Ventilated		exterior R _{se}		0.13			
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]			
Gypsum Board	0.250					13			
Plywood Sheathing	0.130					13			
Ins. - Batt	0.054	Soft wood - 2x6 studs @ 16" OC	0.130			140			
Plywood Sheathing	0.130					13			
Ins. - blown cellulose	0.039					368			
Ins. - blown cellulose	0.039	Soft wood - 2x6 studs @ 16" OC	0.130			89			
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total			
85%		15.0%				63.5 cm			
U-value supplement				U-value:		0.071 W/(m ² K)			
						Rip-79.6			

5.3 Roof construction



Assembly no.		02ud				R1 - Joist Roof (page A601)		Interior insulation?	
Orientation of building element		1-Roof		Heat transmission resistance [m ² K/W]		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]			
Ceiling finish - gypsum	0.300					13			
Fibre Glass Batt	0.054	Wood 2x4 Cross Strapping @ 20" OC	0.130			89			
Plywood 1/2"	0.130					13			
Ins. - blown cellulose	0.039			Wood truss beams (2x4) @ 24" OC	0.130	89			
Ins. - blown cellulose	0.039					533			
Ins. - blown cellulose	0.039			Wood truss beams (2x4) @ 24" OC	0.130	89			
						76			
						19			
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total			
78%		12.0%		10.0%		92.1 cm			
U-value supplement				U-value:		0.051 W/(m ² K)			
						Rip-110.31			

5.4 Window and window installation



Sliding door sill example

Description of the window (frame) construction, manufacturer	Fenstur (Wescon Cedar Products Ltd.) and Cascadia Windows and Doors.
Make window (frame; product name)	(Fenstur product) Wooden frame, triple glazed, lift and slide, PH certified patio door. Fibreglass frame, triple glazed, PH certified fixed and operable (universal series) windows.
Frame U-value U_f	0.88 W/(m ² K) (average)
Glazing construction	Argon filled; 4 16 4 16 4 (typical)
Glass U-value U_g	0.56 W/(m ² K) (average)
G-value of the glazing	0.45 (average)



6. Description of the airtight envelope

Mid-construction and final airtightness testing was carried out by Bernhardt Contracting. .

Combined Test Data (Average Values)

	Results	Uncertainty
Corrected flow at 50 Pa, [L/s]	100.05	+/-0.2%
Air changes per hour at 50 Pa [1/h]:	0.61	+/-0.8%
Corrected flow at 10 Pa, [L/s]	28.900	+/-0.2%
Equivalent leakage area at 10 Pa [cm ²]	116.0	+/-0.8%
Effective leakage area at 10 Pa [cm ²]	70.80	+/-0.8%
Permeability at 50 Pa, [L/s/m ²]	0.1197	+/-0.2%
Specific Leakage Rate at 50 Pa, [L/s/m ²]	0.520	+/-0.2%
Normalized Leakage Area [cm ² /m ²):	0.139	

Air tightness concept

Exterior Assemblies: exterior weather barrier, interior plywood airtight sheathing, tape seams.

Connection window: Self adhesive laps over weather barrier



Plywood sheathing, tape sealing photographed during construction.

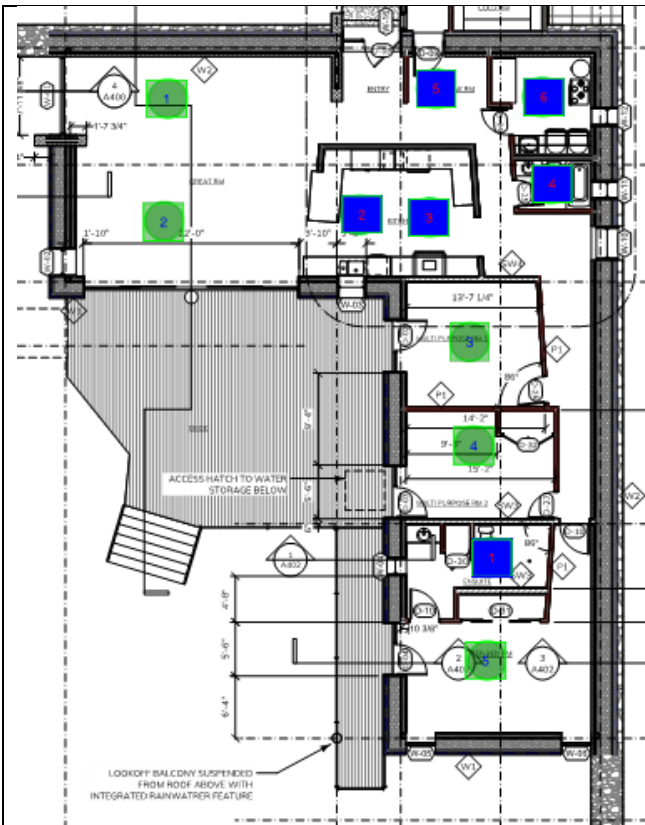
7. Ventilation System

A high performance, PH certified ventilation system was selected for the project's size and performance needs.



Make ventilation system	Zehnder ComfoAir Q350
effective heat supply rate	88.7 %
Electrical efficiency	0.24 Wh/m ³

8. Ventilation planning



Supply air rooms (green) are all 3 bedrooms and great room.

Exhaust air rooms (blue) are bathrooms, kitchen, cloak room, and service room.

Door undercuts allow transfer from supply to exhaust zones, and through east corridor area.

9. Heating and Cooling

Space heating and cooling is provided by a Daikin air source heat pump mini split system.



Daikin outdoor unit

Domestic hot water is served by a Rheem Prestige ProTerra electric hot water system.



10. PHPP results

Passive House Verification



Building:	Poynter Passive House ("Gabion House")		
Street:	(omitted for this document)		
Postcode/City:	V9E 2C8	Saanich	
Province/Country:	BC	Canada	
Building type:	Single family home		
Climate data set:	CA0025a-Victoria		
Climate zone:	3: Cool-temperate	Altitude of location:	40.4 m
Home owner / Client:	(omitted for this document)		
Street:	(omitted for this document)		
Postcode/City:	V9E 2C8	Saanich	
Province/Country:	BC	Canada	
Mechanical engineer:	Interactive Construction		
Street:	843 Parklands Drive		
Postcode/City:	V9A 4L4	Victoria	
Province/Country:	BC	Canada	
Certification:	Home Energy Services		
Street:	1609 8th Street		
Postcode/City:	94710		
Province/Country:	California		
Year of construction:	2021	Interior temperature winter [°C]:	20.0
No. of dwelling units:	1	Interior temp. summer [°C]:	25.0
No. of occupants:	3.1	Internal heat gains (IHG) heating case [W/m²]:	2.4
		IHG cooling case [W/m²]:	2.4
		Specific capacity [Wh/K per m² TFA]:	60
		Mechanical cooling:	x

Architecture:	Waymark Architecture		
Street:	1826 Government Street		
Postcode/City:	V8T 4N5	Victoria	
Province/Country:	BC	Canada	
Energy consultancy:	Focal Engineering		
Street:	467 John Street		
Postcode/City:	V8T 5H1		
Province/Country:	BC	Canada	

Specific building characteristics with reference to the treated floor area

Criteria	Value	Comparison	Alternative criteria		Fulfilled? ²
			Criteria	Alternative criteria	
Space heating	Treated floor area m ²				
	192.5				
	Heating demand kWh/(m ² a)	≤	15	-	yes
	14.0		-	10	
	Heating load W/m ²	≤	-	10	
	10.6				
Space cooling	Cooling & dehum. demand kWh/(m ² a)	≤	15	15	yes
	1		-	10	
	Cooling load W/m ²	≤	-	10	
	1				
	Frequency of overheating (> 25 °C) %	≤	-	-	-
	0		10	-	yes
	Frequency of excessively high humidity (> 12 g/kg) %	≤			
	0				
Airtightness	Pressurization test result n ₅₀ 1/h	≤	0.6		yes
	0.6				
Non-renewable Primary Energy (PE)	PE demand kWh/(m ² a)	≤	-		-
	107				
Primary Energy Renewable (PER)	PER demand kWh/(m ² a)	≤	60	60	yes
	53		-	-	
	Generation of renewable energy (in relation to projected building footprint area)	≥			
	22				

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