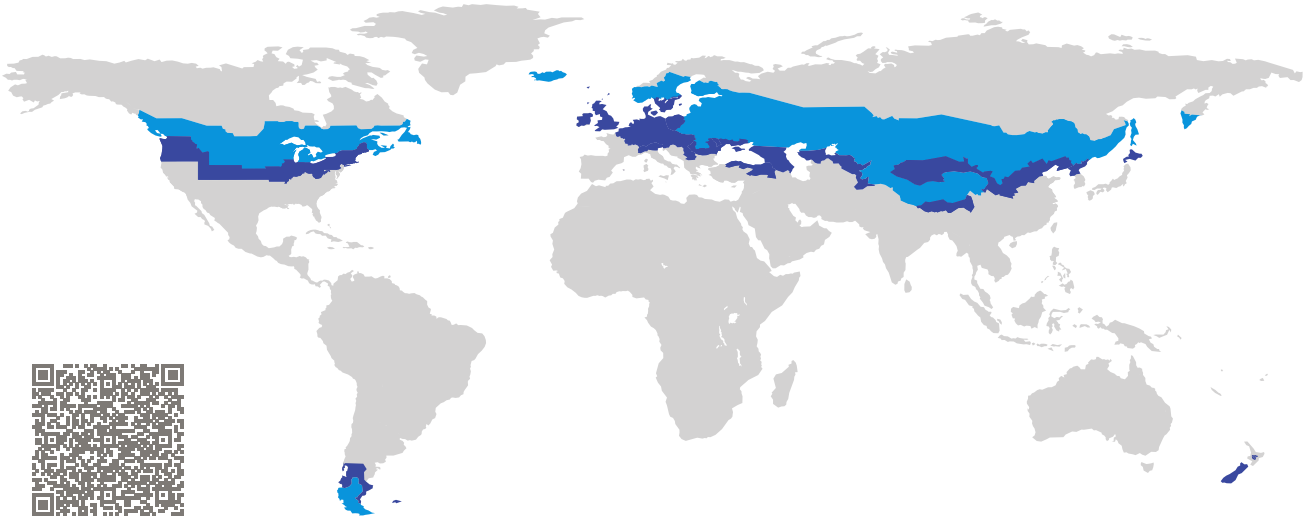
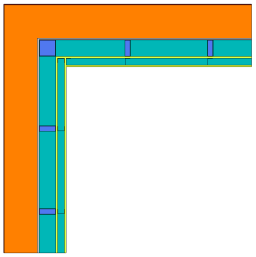
CERTIFICATE

Certified Passive House Component

Component-ID 1902cs02 valid until 31st December 2025

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany





Category:	**Construction system**
Manufacturer:	**Net-Zero Modular Inc., Woodbine, Canada**
Product name:	**Net-Zero Modular Passivhaus System**

Hygiene criterion

The mininum temperature factor of the interior surfaces is $f_{Rsi=0.25\,m^2\,K/W} \geq 0.75$

Comfort criterion

The U-value of the installed windows is $U_{wi} \leq 0.65\,W/(m^2\,K)$

Efficiency criteria

Heat transfer coefficient of building envelope: $U * f_{PHI} \leq 0.12\,W/(m^2\,K)$

Temperature factor of opaque junctions: $f_{Rsi=0.25\,m^2\,K/W} \geq 0.88$

Thermal bridge-free design for key connection details: $\Psi \leq 0.01\,W/(m\,K)$

An airtightness concept for all components and connection details was provided.

It was confirmed that the structure will dry out within 12 months and there is no risk of moisture-related damage.

cold climate

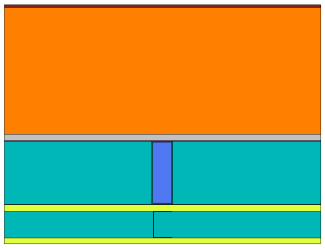
CERTIFIED COMPONENT

Passive House Institute

Net-Zero Modular Inc.
Woodbine Avenue Suite 500 Markham ON L3R 6G2, 7030 Woodbine, Canada
✉ info@modularpassivhaus.com | https://modularpassivhaus.com

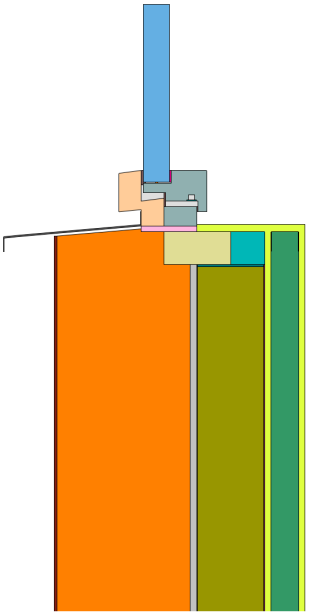
Opaque building envelope

The system is made of a main support layer made from steel tubing (120 mm x 120 mm) forming the modules with a fibre cement board on the outside. On the inside of this main support layer is an insulated installation layer made from gypsum fibre boards and standard drywall construction profiles. The main insulation of the system is glued to the outside of the fibre cement board. For the floor a sandwich panel with insulation inside is used on the inside of the main support structure. The modules are placed on an insulated slab. The main support layer of the floor therefore does not contain any insulation. It is only placed below the concrete slab and in the sandwich panel on top of the main support layer. For the roof a sandwich panel is used on the top surface of the main support structure and additional insulation placed on top of this. The system is designed to be produced offsite and then carried onto the jobsite module by module. Through the construction with steel buildings with multiple stories are possible.



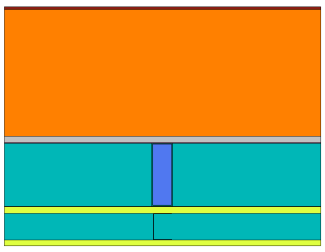
Windows

Windows are placed in the insulation layer on the outside surface of the main support layer. For the connection of the window to the main support structure a block of wood is used. For the certification a passive house suitable window was used. All calculation were carried out using a triple pane wood-aluminum window.



Airtightness concept

Airtightness is ensured by using the fibre cement board on the outside of the main support layer. The connections of the modules and to the windows are to be sealed with airtight tape.



Summary of values

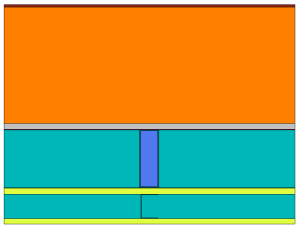
Opaque assemblies		U-value W/(m² K)	Thickness mm
exterior wall	(EW1) 	0.12	453
flat roof	(FR1) 	0.12	376
floor slab	(FS1) 	0.18	544

Frame Cuts with ”dummy window - cold” from ”dummy window manufacturer” (0001)					
Frame values			Frame width b_f mm	U-value frame U_f W/(m^2 K)	Ψ-glazing edge Ψ_g W/(m K)	Temp. Factor $f_{Rsi=0.25}$ [-]
Bottom	(OB1)		100	0.74	0.022	0.75
Top	(OH1)		100	0.56	0.023	0.77
Lateral	(OJ1)		100	0.56	0.023	0.77
Spacer: Super Spacer TriSeal / T-Spacer Premium Plus				Secondary seal: Butyl		

Junctions		U1 U2 W/(m² K)	Ψ-value Ψ W/(m K)	Temp. factor $f_{Rsi=0.25}$ [-]
Ceiling integration into exterior wall (EW1_EW1_CE_1)		0.12 0.12	0.010	0.935
Exterior corner exterior wall (EW1_EW1_ec_1)		0.12 0.12	–0.061	0.878
Interior corner exterior wall (EW1_EW1_ic_1)		0.12 0.12	0.026	0.924
Internal wall integration into exterior wall (EW1_EW1_IW_1)		0.12 0.12	0.009	0.924
Internal wall integration into exterior wall (EW1_EW1_IW_1)		0.12 0.12	–0.001	0.923
Panel joint exterior wall (EW1_EW1_pj_1)		0.12 0.12	0.010	0.924
Roof parapet flat roof (EW1_FR1_rp_1)		0.12 0.12	–0.055	0.876
Window bottom operable window in exterior wall (EW1_OB1_2)		0.12 0.74	0.030	0.783
Window head operable window in exterior wall (EW1_OH1_1)		0.12 0.56	–0.001	0.824
Window jamb operable window in exterior wall (EW1_OJ1_1)		0.12 0.56	0.000	0.822
Panel joint flat roof (FR1_FR1_pj_1)		0.12 0.12	0.009	0.924
Exterior wall plinth on floor slab (FS1_EW1_1)		0.18 0.12	–0.074	0.896
Panel joint floor slab (FS1_FS1_pj_1)		0.18 0.18	0.001	0.953

Opaque Assemblies

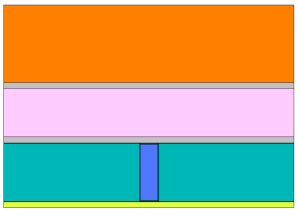
exterior wall (EW1)



Material	Lambda W/(m K)	Thickness (mm)
organic compound plaster (exterior plaster)	0.700	5
Insulation 040	0.040	240
fibre-cement board	0.350	12
Insulation 040 + 1.0% steel	0.540	122
gypsum wall board acc. to DIN EN 12859 750 kg/r	0.350	12
Insulation 040	0.040	50
gypsum wall board acc. to DIN EN 12859 750 kg/r	0.350	12

Total thickness: 453 mm
Rsi: 0.13 m^2 K/W
Rse: 0.04 m^2 K/W
U-value: 0.12 W/(m^2 K)

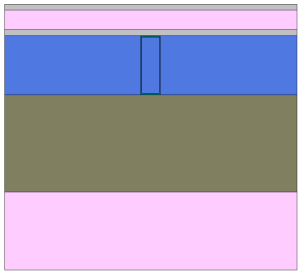
flat roof (FR1)



Material	Lambda W/(m K)	Thickness (mm)
Insulation 040	0.040	120
fibre-cement board	0.350	12
Insulation 040	0.040	100
fibre-cement board	0.350	12
Insulation 040 + 0.0% steel	0.040	120
gypsum wall board acc. to DIN EN 12859 750 kg/r	0.350	12

Total thickness: 376 mm
Rsi: 0.10 m^2 K/W
Rse: 0.04 m^2 K/W
U-value: 0.12 W/(m^2 K)

floor slab (FS1)



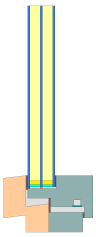
Material	Lambda W/(m K)	Thickness (mm)
fibre-cement board	0.350	12
Insulation 040	0.040	40
fibre-cement board	0.350	12
air cavity - heat flow downwards + 0.0% steel	0.540	120
concrete (1 % steel)	2.300	200
Insulation 040	0.040	160

Total thickness: 544 mm
Rsi: 0.17 m^2 K/W
Rse: - m^2 K/W
U-value: 0.18 W/(m^2 K)

Frame Cuts with ”dummy window - cold” from ”dummy window manufacturer” (0001)

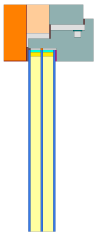
Bottom

b_f = 100 mm
U_f = 0.74 W/(m^2 K)
Ψ_g = 0.022 W/(m K)
f_{Rsi} = 0.75



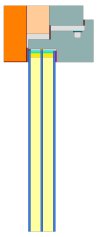
Top

b_f = 100 mm
U_f = 0.56 W/(m^2 K)
Ψ_g = 0.023 W/(m K)
f_{Rsi} = 0.77



Lateral

b_f = 100 mm
U_f = 0.56 W/(m^2 K)
Ψ_g = 0.023 W/(m K)
f_{Rsi} = 0.77



Ceiling integration

into exterior wall

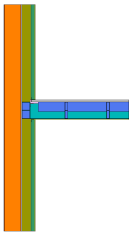
(EW1_EW1_CE_1)

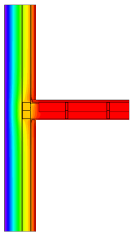
U_{EW1} = 0.12 W/(m² K)

U_{EW1} = 0.12 W/(m² K)

Ψ = 0.010 W/(m K)

f_{Rsi} = 0.935





Exterior corner

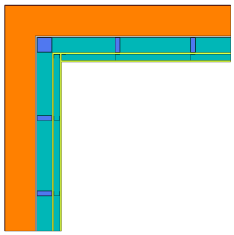
exterior wall (EW1_EW1_ec_1)

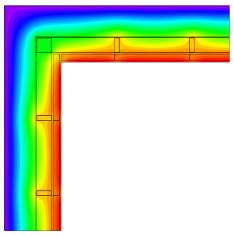
U_{EW1} = 0.12 W/(m² K)

U_{EW1} = 0.12 W/(m² K)

Ψ = –0.061 W/(m K)

f_{Rsi} = 0.878





Interior corner

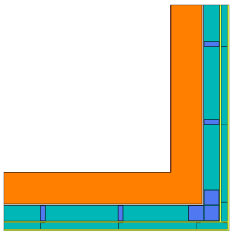
exterior wall (EW1_EW1_ic_1)

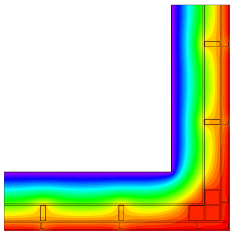
U_{EW1} = 0.12 W/(m² K)

U_{EW1} = 0.12 W/(m² K)

Ψ = 0.026 W/(m K)

f_{Rsi} = 0.924





Internal wall integration

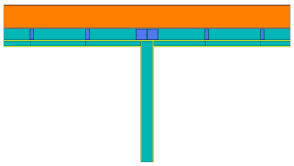
into exterior wall (EW1_EW1_IW_1)

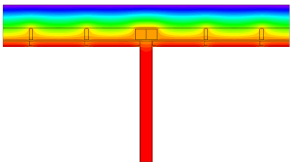
U_{EW1} = 0.12 W/(m² K)

U_{EW1} = 0.12 W/(m² K)

Ψ = 0.009 W/(m K)

f_{Rsi} = 0.924

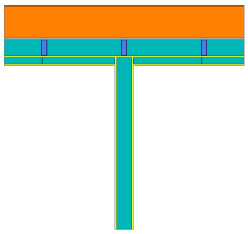


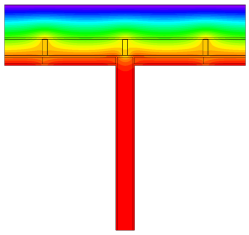


Internal wall integration

into exterior wall (EW1_EW1_IW_1)

U_{EW1} = 0.12 W/(m² K)
U_{EW1} = 0.12 W/(m² K)
Ψ = –0.001 W/(m K)
f_{Rsi} = 0.923

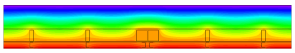




Panel joint

exterior wall (EW1_EW1_pj_1)

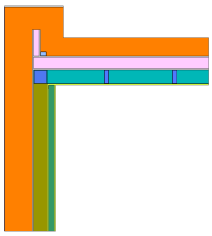
U_{EW1} = 0.12 W/(m² K)
U_{EW1} = 0.12 W/(m² K)
Ψ = 0.010 W/(m K)
f_{Rsi} = 0.924

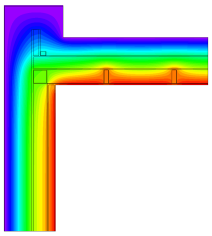


Roof parapet

flat roof (EW1_FR1_rp_1)

U_{EW1} = 0.12 W/(m² K)
U_{FR1} = 0.12 W/(m² K)
Ψ = –0.055 W/(m K)
f_{Rsi} = 0.876





Window bottom

operable window in exterior wall (EW1_OB1_2)

U_{EW1} = 0.12 W/(m² K)
U_{OB1} = 0.74 W/(m² K)
Ψ = 0.030 W/(m K)
f_{Rsi} = 0.783

Window head

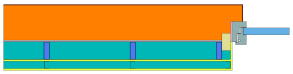
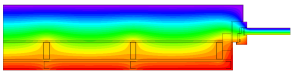
operable window in exterior wall (EW1_OH1_1)

U_{EW1} = 0.12 W/(m² K)
U_{OH1} = 0.56 W/(m² K)
Ψ = –0.001 W/(m K)
f_{Rsi} = 0.824

Window jamb

operable window in exterior wall (EW1_OJ1_1)

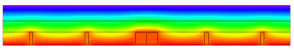
U_{EW1} = 0.12 W/(m² K)
U_{OJ1} = 0.56 W/(m² K)
Ψ = 0.000 W/(m K)
f_{Rsi} = 0.822

Panel joint

flat roof (FR1_FR1_pj_1)

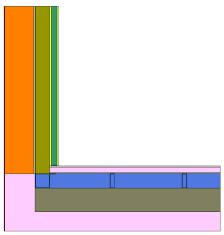
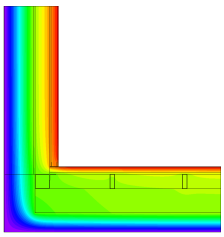
U_{FR1} = 0.12 W/(m² K)
U_{FR1} = 0.12 W/(m² K)
Ψ = 0.009 W/(m K)
f_{Rsi} = 0.924

Exterior wall plinth

on floor slab (FS1_EW1_1)

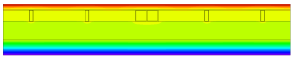
U_{FS1} = 0.18 W/(m² K)
U_{EW1} = 0.12 W/(m² K)
Ψ = –0.074 W/(m K)
f_{Rsi} = 0.896

Panel joint

floor slab (FS1_FS1_pj_1)

U_{FS1} = 0.18 W/(m² K)
U_{FS1} = 0.18 W/(m² K)
Ψ = 0.001 W/(m K)
f_{Rsi} = 0.953

Disclaimer: The Passive House Institute GmbH (PHI) carries out heat transfer analyses according to the standards set out in the document "Criteria and Algorithms for Certified Passive House Components: Opaque Construction Systems" and based on information provided by the manufacturer. It is the responsibility of the project leader, e.g. the architect to ensure the appropriate assessments have been carried out for specific buildings, which may include more detailed analyses than those carried out for this certification. Use of a certified Passive House component does not guarantee that a construction project will achieve the Passive House, EnerPHit or PHI Low Energy Building standard. In all cases full details are to be made available by the manufacturer on request to the engaged certified Passive House designer or certifier, who will be permitted to check these against the construction information and to perform on-site checks as part of the quality assurance process.