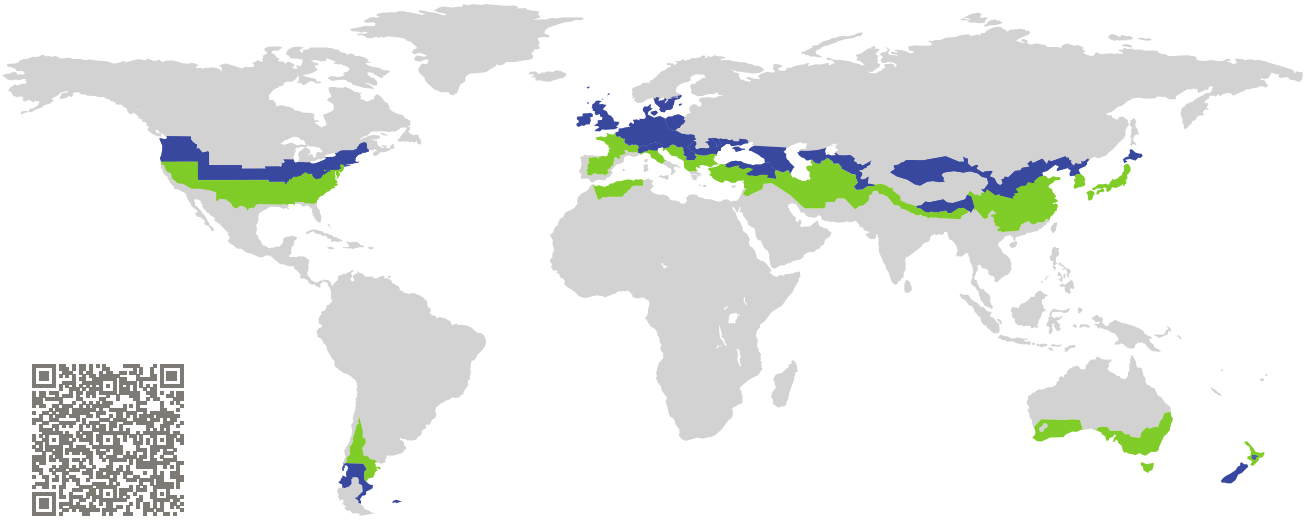
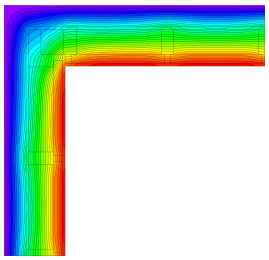
CERTIFICATE

Certified Passive House Component

Component-ID 2039cs03 valid until 31st December 2025

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany





Category:	**Construction system**
Manufacturer:	**Ziher d. o. o., Gorišnica, Slovenia**
Product name:	**PassiveTech+ ZIHER STENA**

Hygiene criterion

The mininum temperature factor of the interior surfaces is $f_{Rsi=0.25\,m^2\,K/W} \geq 0.70$

Comfort criterion

The U-value of the installed windows is $U_{wi} \leq 0.85\,W/(m^2\,K)$

Efficiency criteria

Heat transfer coefficient of building envelope: $U * f_{PHI} \leq 0.15\,W/(m^2\,K)$

Temperature factor of opaque junctions: $f_{Rsi=0.25\,m^2\,K/W} \geq 0.86$

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.

cool, temperate climate

CERTIFIED COMPONENT

Passive House Institute

Ziher d. o. o.
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☎ +386 (0)51 646 543 | ✉ marija.kelenc@ziher.si | http://www.ziher-hise.si |

Opaque building envelope

PassiveTech+ ZIHER® STENA is a timber frame construction system of 16 x 8 cm timber studs, insulated with a combination of mineral wool (Knauf Unifit, 0,035 W/(mK)), internally with wood fibre (Bestwood Schneider, 0,05 W/(mK)) and externally with graphite EPS (0,031 W/(mk)), fastened with Sto H-60 screws (4/m²). The roof is constructed from 22 x 8 cm beams, insulated with mineral wool (Knauf Unifit, 0,035 W/(mk)) and mineral wool (0,040 W/(mK)). The floor slab is constructed from reinforced concrete, insulated with XPS insulation to the underneath (0,037 W/(mK)) and pressure-resistant insulation (0,050 W/(mK)) on top.

Windows

Certification was carried out using the KÖMMERLING 88 Mitteldichtung PVC window frame from Profine, which has a Uw-value of 0,78 W/(m²K), using a Ug of 0,70 W/(m²K). The window uses in this case a SWISSPACER Ultimate spacer with polysulfide as secondary sealant.

Airtightness concept

The airtightness of the construction system is achieved through the use of an airtight membrane fitted to the interior of the timber frame. For the junctions between membrane sections and connections to openings and the floor slab, adhesive airtightness tape is used.

Summary of values

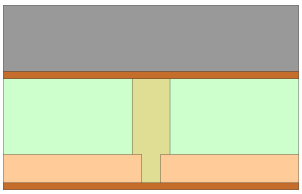
Opaque assemblies		U-value W/(m² K)	Thickness mm
exterior wall	(EW1) 	0.13	390
floor slab	(FS1) 	0.19	530
pitched roof	(RO1) 	0.12	395

Frame Cuts with ”KÖMMERLING 88 Mitteldichtung” from ”profine GmbH” (1163wi03)					
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)		146	0.74	0.025	0.74
Top	(OH1)		116	0.78	0.025	0.74
Lateral	(OJ1)		116	0.78	0.025	0.74
Threshold	(OT1)		146	0.74	0.025	0.74
Spacer: SWISSPACER Ultimate				Secondary seal: Polysulfide		

Junctions	U1 U2 U3 W/(m² K)	Ψ-value Ψ W/(m K)	Temp. factor $f_{Rsi=0.25}$ [-]
Ceiling integration into exterior wall (EW1_EW1_CE_1) 	0.13 0.13	0.024	0.928
Exterior corner exterior wall (EW1_EW1_ec_1) 	0.13 0.13	−0.052	0.886
Interior corner exterior wall (EW1_EW1_ic_1) 	0.13 0.13	0.032	0.955
Internal wall integration into exterior wall (EW1_EW1_IW_1) 	0.13 0.13	−0.001	0.955
Window bottom operable window in exterior wall (EW1_OB1_1) 	0.13 0.74	0.053	0.773
Window head operable window in exterior wall (EW1_OH1_1) 	0.13 0.78	0.015	0.795
Window jamb operable window in exterior wall (EW1_OJ1_1) 	0.13 0.78	0.011	0.795
Roof eave pitched roof (EW1_RO1_ea_1) 	0.13 0.12	−0.004	0.913
Roof verge pitched roof (EW1_RO1_ve_1) 	0.13 0.12	−0.060	0.909
Threshold to floor slab (FS1_EW1_OT1_1) 	0.19 0.13 0.74	0.016	0.706
Exterior wall plinth on floor slab (FS1_EW1_1) 	0.19 0.13	−0.046	0.926
Internal wall integration into floor slab (FS1_FS1_IW_1) 	0.19 0.19	0.000	0.926
Roof ridge pitched roof (RO1_RO1_ri_1) 	0.12 0.12	−0.047	0.935

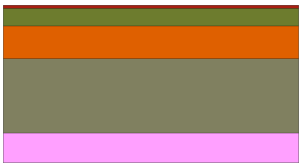
Opaque Assemblies

exterior wall (EW1)



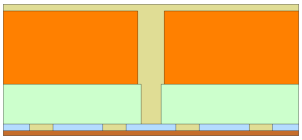
Material	Lambda W/(m K)	Thickness (mm)
Gypsum fibre board 40	0.400	15
Wood fiber ins. + timber	0.057	60
Mineral wool ins. + timber	0.044	160
Gypsum fibre board 40	0.400	15
Graphite EPS	0.039	140
	Total thickness: 390 mm	
	Rsi: 0.13 m^2 K/W	
	Rse: 0.04 m^2 K/W	
	U-value: 0.13 W/(m^2 K)	

floor slab (FS1)



Material	Lambda W/(m K)	Thickness (mm)
hardwood 700 kg/m^3 – perpendicular to grain direction	0.180	10
cement screet	1.400	60
insulation 050	0.050	110
concrete (1 % steel)	2.300	250
XPS insulation	0.037	100
	Total thickness: 530 mm	
	Rsi: 0.17 m^2 K/W	
	Rse: - m^2 K/W	
	U-value: 0.19 W/(m^2 K)	

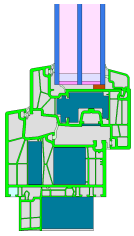
pitched roof (RO1)

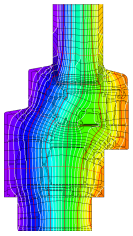


Material	Lambda W/(m K)	Thickness (mm)
Gypsum fibre board 40	0.400	15
Closed air + timber	0.126	20
Mineral wool + timber	0.042	120
Insulation + timber	0.046	220
softwood, OSB – perpendicular to grain direction	0.130	20
	Total thickness: 395 mm	
	Rsi: 0.10 m^2 K/W	
	Rse: 0.10 m^2 K/W	
	U-value: 0.12 W/(m^2 K)	

Bottom

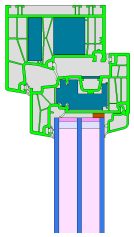
b_f = 146 mm
U_f = 0.74 W/(m² K)
Ψ_g = 0.025 W/(m K)
f_{Rsi} = 0.74

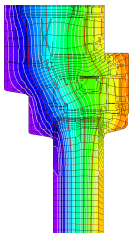




Top

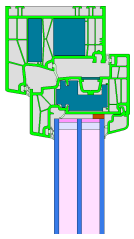
b_f = 116 mm
U_f = 0.78 W/(m² K)
Ψ_g = 0.025 W/(m K)
f_{Rsi} = 0.74

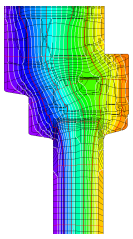




Lateral

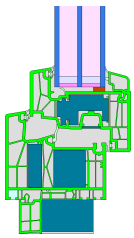
b_f = 116 mm
U_f = 0.78 W/(m² K)
Ψ_g = 0.025 W/(m K)
f_{Rsi} = 0.74

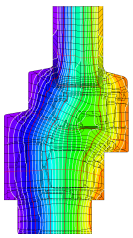




Threshold

b_f = 146 mm
U_f = 0.74 W/(m² K)
Ψ_g = 0.025 W/(m K)
f_{Rsi} = 0.74





Ceiling integration

into exterior wall

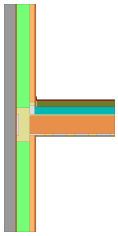
(EW1_EW1_CE_1)

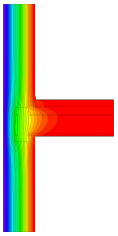
U_{EW1} = 0.13 W/(m² K)

U_{EW1} = 0.13 W/(m² K)

Ψ = 0.024 W/(m K)

f_{Rsi} = 0.928





Exterior corner

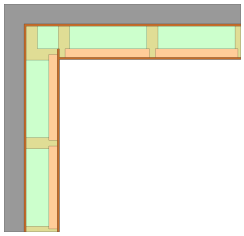
exterior wall (EW1_EW1_ec_1)

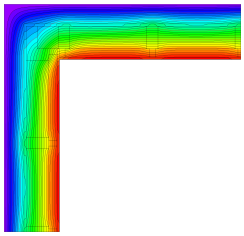
U_{EW1} = 0.13 W/(m² K)

U_{EW1} = 0.13 W/(m² K)

Ψ = –0.052 W/(m K)

f_{Rsi} = 0.886





Interior corner

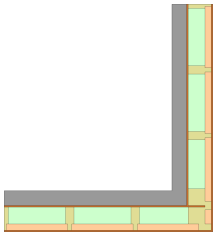
exterior wall (EW1_EW1_ic_1)

U_{EW1} = 0.13 W/(m² K)

U_{EW1} = 0.13 W/(m² K)

Ψ = 0.032 W/(m K)

f_{Rsi} = 0.955



Internal wall integration

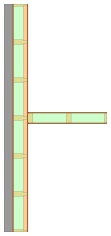
into exterior wall (EW1_EW1_IW_1)

U_{EW1} = 0.13 W/(m² K)

U_{EW1} = 0.13 W/(m² K)

Ψ = –0.001 W/(m K)

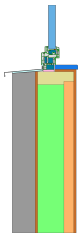
f_{Rsi} = 0.955

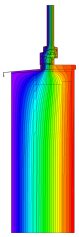


Window bottom

operable window in exterior wall (EW1_OB1_1)

U_{EW1} = 0.13 W/(m² K)
U_{OB1} = 0.74 W/(m² K)
Ψ = 0.053 W/(m K)
f_{Rsi} = 0.773

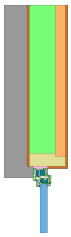




Window head

operable window in exterior wall (EW1_OH1_1)

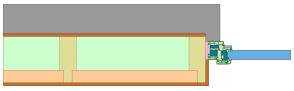
U_{EW1} = 0.13 W/(m² K)
U_{OH1} = 0.78 W/(m² K)
Ψ = 0.015 W/(m K)
f_{Rsi} = 0.795

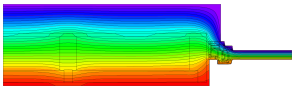


Window jamb

operable window in exterior wall (EW1_OJ1_1)

U_{EW1} = 0.13 W/(m² K)
U_{OJ1} = 0.78 W/(m² K)
Ψ = 0.011 W/(m K)
f_{Rsi} = 0.795

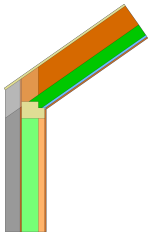


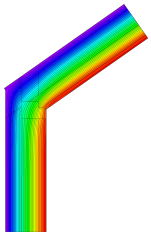


Roof eave

pitched roof (EW1_RO1_ea_1)

U_{EW1} = 0.13 W/(m² K)
U_{RO1} = 0.12 W/(m² K)
Ψ = –0.004 W/(m K)
f_{Rsi} = 0.913

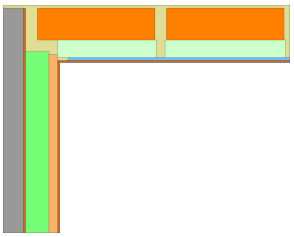


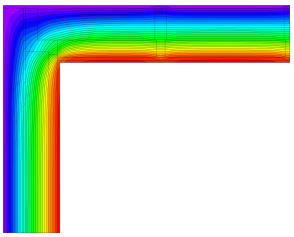


Roof verge

pitched roof (EW1_RO1_ve_1)

U_{EW1} = 0.13 W/(m² K)
U_{RO1} = 0.12 W/(m² K)
Ψ = –0.060 W/(m K)
f_{Rsi} = 0.909

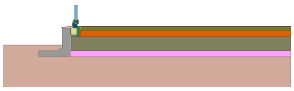
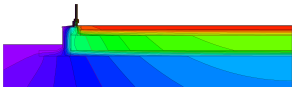




Threshold

to floor slab (FS1_EW1_OT1_1)

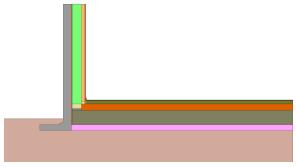
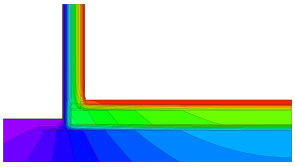
U_{FS1} = 0.19 W/(m² K)
U_{EW1} = 0.13 W/(m² K)
U_{OT1} = 0.74 W/(m² K)
Ψ = 0.016 W/(m K)
f_{Rsi} = 0.706

Exterior wall plinth

on floor slab (FS1_EW1_1)

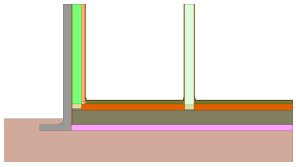
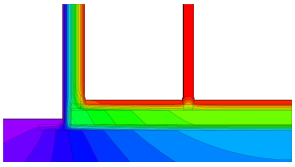
U_{FS1} = 0.19 W/(m² K)
U_{EW1} = 0.13 W/(m² K)
Ψ = –0.046 W/(m K)
f_{Rsi} = 0.926

Internal wall integration

into floor slab (FS1_FS1_IW_1)

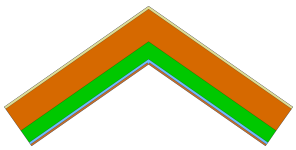
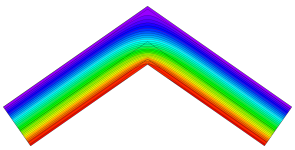
U_{FS1} = 0.19 W/(m² K)
U_{FS1} = 0.19 W/(m² K)
Ψ = 0.000 W/(m K)
f_{Rsi} = 0.926

Roof ridge

pitched roof (RO1_RO1_ri_1)

U_{RO1} = 0.12 W/(m² K)
U_{RO1} = 0.12 W/(m² K)
Ψ = –0.047 W/(m K)
f_{Rsi} = 0.935

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.