



Certification report | Zertifizierungsbericht

Passive House Institute

Building system Wandsystem



for the warm temperate climate
für das warm-gemäßigtes Klima

Product | Produkt: **Termoarcilla® Ventilated Rainscreen Wall**

Client | Auftraggeber: **Consortio Termoarcilla**

Construction | Konstruktion **Solid construction with ventilated facade |
Massivbauweise mit hinterlüfteter Fassade**

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1 Introduction

Because a separate heating system is not necessarily required in Passive Houses, high demands are placed on the quality of the building components used. The colder the climate, the higher the requirements for the components. To cover this, PHI has identified regions of similar requirements, and defined certification criteria. These criteria are available for free download at the website of the Passive House Institute.

If the below summarized requirements are met and a well-designed airtightness layer is proven, the label "Certified Passive House Component" can be awarded by the Passive House Institute (PHI)

Table 1: Certification criteria depending on the climate zone

Climate zone	Hygiene criterion ⁸	Comfort criterion	Efficiency criteria			Moisture criteria ⁶	
			U-value of the exterior building component $U_{\text{opaque}} * f_{R, \text{PHI}} \leq$	Purely opaque details $f_{R_{\text{Si}=0.25}} \geq^3$	Absence of thermal bridges $\Psi_a \leq^4$	Condensation	Ma limit according to DIN EN ISO 13788 \leq
	[-]	[W/(m ² K)]	[W/(m ² K)]	[-]	[W/(mK)]	[-]	[g/m ²]
1 Arctic	0.80	0.45 (0.35)	0.09	0.90	0.010 ⁵	Condensation should be completely evaporated at the end of 12 months	200 ⁷
2 Cold	0.75	0.65 (0.52)	0.12	0.88			
3 Cool, temperate	0.70	0.85 (0.70)	0.15	0.86			
4 Warm, temperate	0.65	1.05 (0.90)	0.25	0.82			
5 Warm	0.55	1.25 (1.10)	0.50	0.74			
6 Hot	None	1.25 (1.10)	0.50	0.74			
7 Very hot	None	1.05 (0.90)	0.25	0.82			

1 applies for vertical windows with a test size of 1.23*1.48 m. The criteria for other transparent building components can be taken from the relevant certification criteria. Value in brackets: respective reference glazing.

2 $f_{R, \text{PHI}}$: Reduction factor: always 1.0, exception: areas in contact with the ground and towards the unheated basement in the climate zones 1 – 4: 1.6; e. g. for climate zone 3 the U-value criterion becomes 0.25 W/(m²K).

3 $f_{R_{\text{Si}=0.25}} \geq$ see certification criteria.



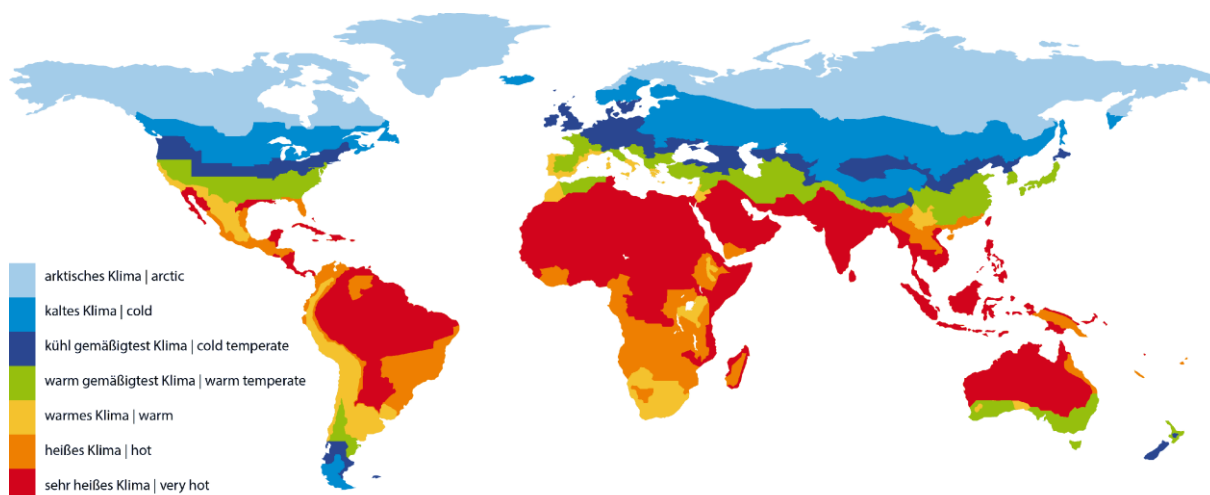
4 as a thermal bridge loss coefficient based on external dimensions and length. Specific constructions such as inner edges are exempted from this criterion.

5 Geometric thermal bridges, where the insulation thickness around the junction is consistent, but the calculation methodology results in a Psi-value of $> 0.010 \text{ W}/(\text{mK})$, are exempt from this criterion.

6 These criteria are based on the Glaser Method and allow an assessment of the likelihood of the occurrence of interstitial condensation during the winter. This method brings more reliable results for lightweight and airtight components used in cool and non-humid locations away from the equator that do not contain materials with a large water or heat storage capacity. Where the criteria are not met following this approach, a dynamic simulation according to EN 15026 can be carried out to provide greater detail. It is the responsibility of 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. In addition on-site measurements like airtightness testing as well as trained tradespeople help to ensure construction quality.

7 The Ma limit (maximum accumulated moisture content) is based on the ISO 13788 and reflects the maximum amount of condensate in order to prevent run-off of liquid water from watertight surfaces. It may make sense in certain cases to calculate a more specific Ma limit according to the materials present in the wall, roof and floor constructions.

8 For door thresholds the dew point criterion applies according to the certification criteria.



2 Description of the certified system

2.1 Opaque building envelope

The system consists of a Termoarcilla® blocks wall with a 15 mm thick interior gypsum plaster, a ventilated facade system with 140 mm thick thermal insulation, and a gypsum board on the interior side with a 60 mm thick service cavity between the finish board and the wall.

The Termoarcilla® wall is formed by placing the blocks with horizontal mortar joints. The ventilated facade includes mineral wool insulation panels

(0.040 W/(mK)) mechanically fixed to the blocks using the FLH R ventilated facade anchoring system from Fisher, which is Passive House certified. The interior wall finish is built with a galvanized steel structure on which the gypsum board is screwed.

The system has been assessed according to the Passive House Institute's criteria for opaque construction systems and has been validated as suitable for Passive House projects in the warm-temperate and warm climate zones.

2.2 Windows

For the purposes of certification, a standard passive house window ($U_w = 1.00 \text{ W}/(\text{m}^2\text{K})$ with $U_g = 0.90 \text{ W}/(\text{m}^2\text{K})$) was used. The overall U-value of the installed window of standard size (1.23 m wide by 1.48 m tall) should be no more than 0.05 W/(m²K) greater than the U_w to ensure occupant comfort.

This criterion is met with a window installation solution aligned with the exterior thermal insulation. This construction solution is solved with a wooden support profile on the window sill and metal L-profile anchors on the jambs and lintel.

2.3 Airtightness concept

The system's airtightness is achieved as follows: the interior gypsum plaster layer serves as the airtight layer of the envelope. For junctions with windows and doors, special airtightness tapes are used on

the interior face, maintaining continuity with the gypsum plaster. All junctions with other construction elements use special tapes or airtight paint solutions to ensure the airtightness line of the facade remains consistent in the interior gypsum plaster.

3 Evaluation

The Passive House Institute has defined international component criteria for seven climate zones based on hygiene, comfort and affordability criteria. In principle, components which have been certified

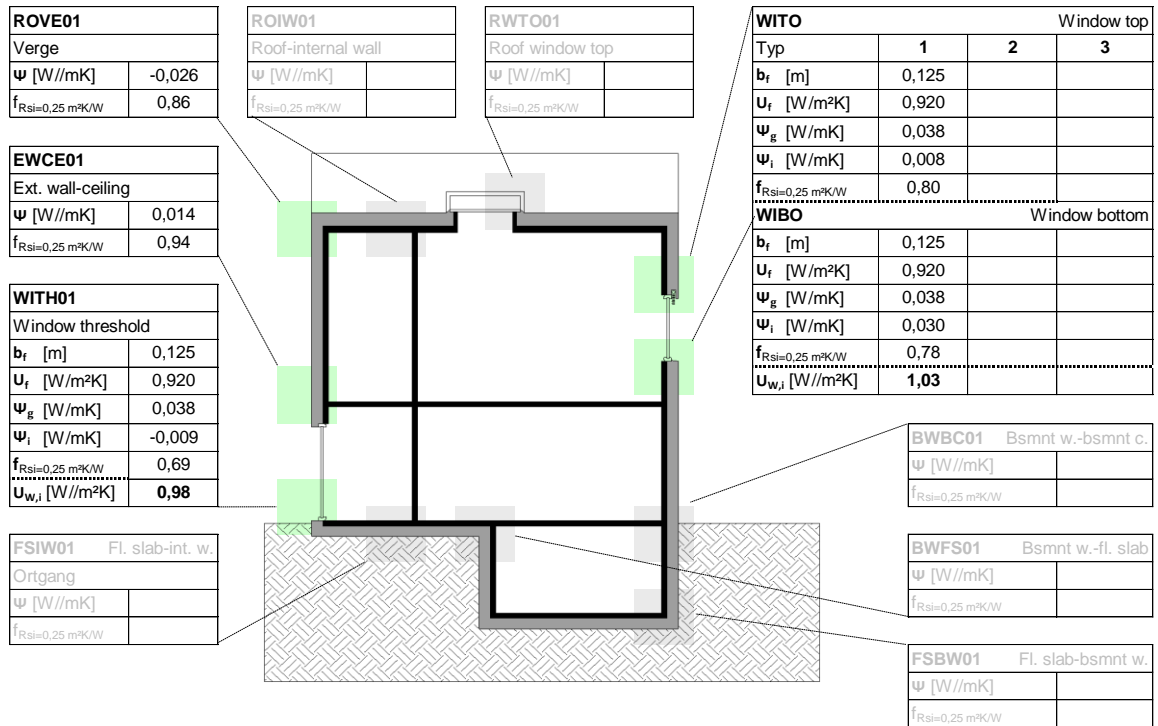
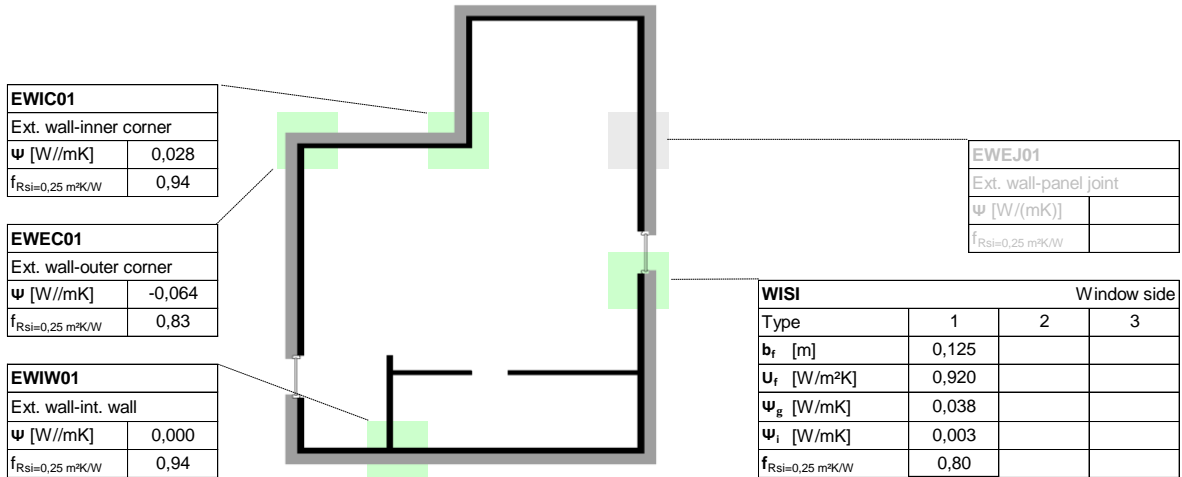
for climate zones with higher requirements may also be used in climates with less stringent requirements. Their use might make economic sense in certain circumstances.

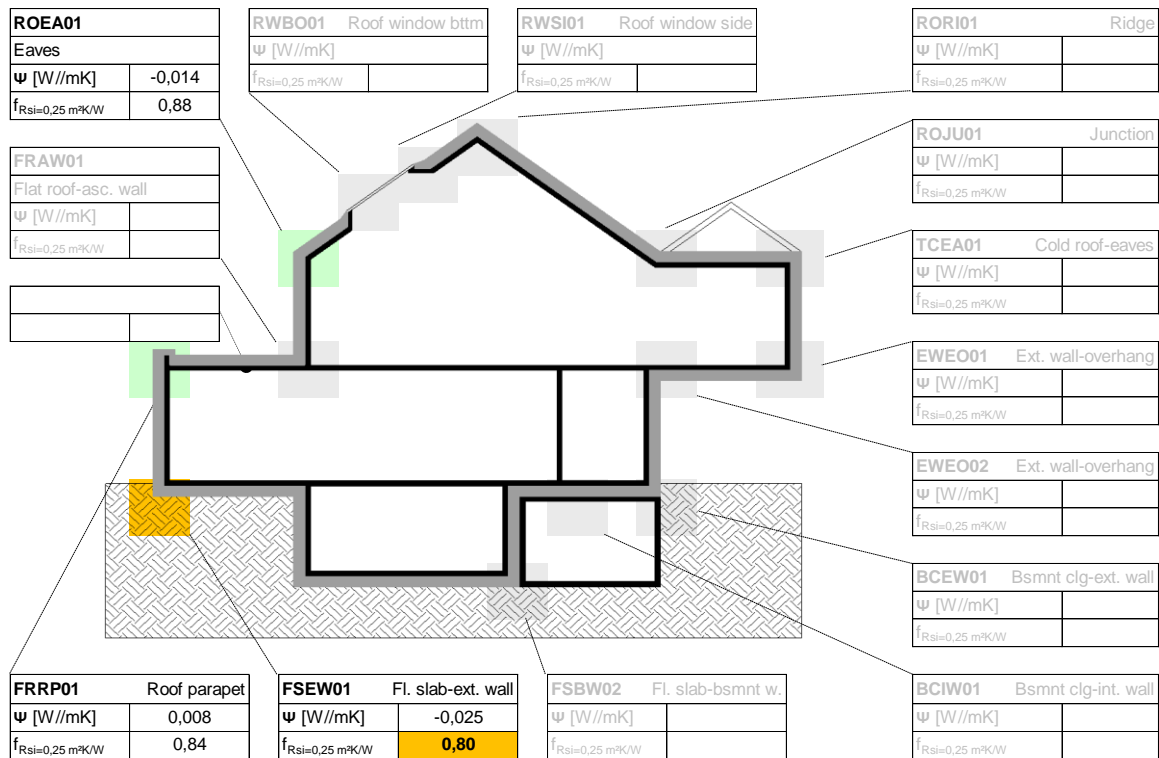


4 Summary of the results

Thermal bridge not calculated
 Criteria achieved

Efficiency criteria not achieved
 Hygiene or comfort criterion not achieved





5 Using the results in the PHPP

The following points are relevant for working with the here presented results in the Passive House Planning Package (PHPP):

- For the system being certified here, the thermal bridges in the regular construction of the buildings shell resulting from regularly occurring interruptions are already included in the U-values by using equivalent thermal conductivities for the materials of the interrupted layers. They do not have to be considered further.
- The results of the calculation of the linear thermal transmittance are always determined based on the external dimensions.
- Additional point thermal bridges may have to be taken into account.



6 Legal information

The following information should be kept in mind when planning and executing the detail solutions documented in this report:

The detail drawings in this documentation are schematic and might be adapted for specific constructions. Sealing of the construction against moisture and the absence of condensation as well as the check of hygrothermal matters was not the subject of this examination. Where necessary, this should be carried out in accordance with the accepted technical standards. The responsibility for checking the above mentioned points lies with the applicant for the certification procedure and/or the user.

The present documentation does not allow conclusions to be drawn regarding other characteristics of the examined construction that may determine its performance and quality. In particular, this documentation is not a substitute for building authority approval.

The scope of the examination and accountability of the certification is limited to the testing routines with regard to compliance with the stated criteria of the Passive House Institute. A legal basis for making any claims against the Passive House Institute Darmstadt Dr. Wolfgang Feist based on the information provided in this report is excluded.





Appendix 1: U-value of building assemblies

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Description of building assembly						Assembly no.	
Rainscreen thermoclay wall - Fachada termoarcilla ventilada						02ud	
Orientation of building assembly (or R_{si})		2-Wall		Interior insulation?			
Adjacent to (or R_{se})		3-Ventilated		U-value supplement [W/(m ² K)]		0.013	
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]	
Gypsum board I Gipskartonplatten 900 kg/m ³ 10456	0.250					15	
Air layer, unventilated, horizontal, thickness: 60 mm + steel studs	0.361					60	
Interior plaster I Gipsputz 10456	0.570					15	
Thermoclay 19 + mortar joints	0.325					190	
Mineral wool 040	0.040					140	
Percentage of sec. 1:	100%	Percentage of sec. 2:		Percentage of sec. 3:			
Heat transmission resistance coefficients						Total thickness [cm]: 42.0	
Interior R_{si} :	0.13	m ² K/W		U-value [W/(m ² K)]:		0.231	
Exterior R_{se} :	0.13	m ² K/W					



Condensation check according to ISO 13788

Glaser Method, carried out using PHI Condensation Tool

EW1 - external wall

Location temperatures		Heating load [°C]	4.4	Cooling load [°C]	27.2	Hours	1		
Assembly definition		θ_e [°C]	28.0	ϕ_e (θ_e)	90%	θ_i [°C]	20.0	ϕ_i (θ_i)	65%

Assembly no.	Building assembly description	Interior insulation?	Ft	Radiation effect	Solar rad.	Sol. rad. fact.	Eff. Solar rad.
EW02	Termoarcilla ventilada	No	1.00	Active	750	1.0	750

Heat transmission resistance [m²K/W]		DT Roof 13788		Radiation attributes	
Orientation of building element	2 - Wall	interior Rsi:	0.13	Reflectivity:	
Adjacent to	3 - Ventilated	exterior Rse:	0.13	Absorptivity:	0.45
For condensation or mould growth on opaque surfaces		interior Rsi:	0.25	Emissivity:	0.81

Climate zone	Limits	PHI	User defined
4			
Region	U-value	fRsi min	0.82
Warm-temperate	0.30		
Location	ES0001b-Madrid		

Pos.	Area section	λ [W/(mK)]	Thickness [mm]	μ [-]	S_d [m]	R [m²K/W]	Temperature [°C]	p_v [Pa]	RH [%]
i	Interior air					0.130	20.00	1519	65%
0	Rsi - Interior surface					0.130	21.27	1519	60%
1	Placa de yeso laminado	0.250	25	10.0	0.25	0.100	22.25	1685	63%
2	Air layer, unventilated, horizontal, thickness: 60 mm	0.333	60	1.0	0.06	0.180	24.01	1725	58%
3	Interior plaster I Gipsputz 10456	0.570	15	8.0	0.12	0.026	24.27	1805	60%
4	EQ_EW1 Termoarcilla 19 + mortar joints	0.325	190	10.0	1.90	0.584	29.98	3068	72%
5	Mörtel, Zement, Sand	1.000	10	8.0	0.08	0.010	30.07	3121	73%
6	Mineral wool 040	0.035	140.0	3.0	0.42	4.000	69.18	3400	11%
7									
8									
9									
10									
0	Rse - Exterior surface					0.130	69.18	3400	11%
e	Exterior air						70.45	3400	90%

Total Values		44.00	2.83	5.161	-9.78	-1.33E-07	0
	[cm]		[m]	[m²K/W]	q tot [W/m2]	g [kg/(m²s)]	Cond. Interfaces

Radiation effect		Active	Surfaces DT	
Exterior Sol-Air Temperature	70.45	1.27	50.45	
	[°C]	[Int DT°C]	[Ext-Int DT°C]	

SRI value		62	Aged SRI value	
	[-]		48	
	[-]		[-]	

Verifications		
Condensation Rsi 0.25 [°C]		
T _{min}	T _s Project	Verified
13.22	22.39	Yes
Mould growth Rsi 0.25 [°C]		
T _{min}	T _s Project	Verified
16.69	22.39	Yes
f _{Rsi}		
f _{Rsi, min}	f _{Rsi} Project	Verified
0.82	0.95	Yes
g _c [g/m² * h]		
g _c		
0.00		
U-Value [W/(m²K)]		
min	Project	Verified
0.300	0.194	Yes

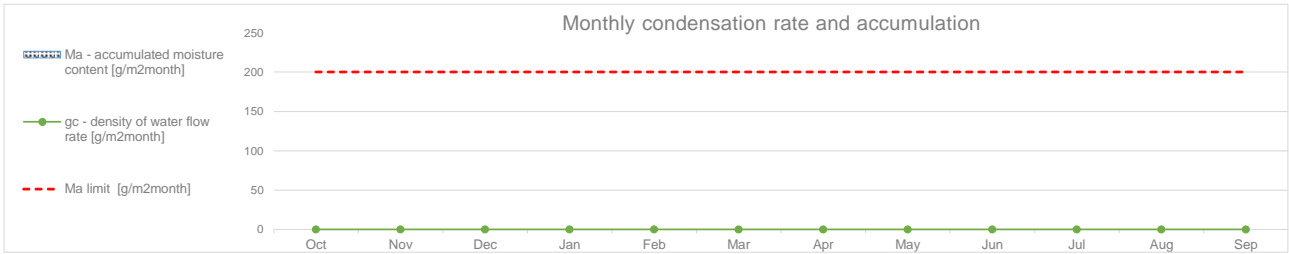


Condensation check according to ISO 13788

Glaser Method, carried out using PHI Condensation Tool

EW1 - external wall

Monthly Condensation rate and accumulation within the whole assembly



	10	11	12	1	2	3	4	5	6	7	8	9
Days	31	30	31	31	28	31	30	31	30	31	31	30
Months	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
gc - density of water flow rate [g/m²month]	0	0	0	0	0	0	0	0	0	0	0	0
Ma - accumulated moisture content [g/m²month]	0	0	0	0	0	0	0	0	0	0	0	0
Ma limit [g/m²month]	200	200	200	200	200	200	200	200	200	200	200	200
Comments												
Interfaces with condensation	0	0	0	0	0	0	0	0	0	0	0	0

Monthly Condensation rate and accumulation within each layer

Drying potential - Long term evaluation

Verifications

Assembly no.													Verification status:
EW1													Assembly verified
Verification status per month: Is the assembly verified?													
Months	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Condensation R _{si} 0,25 [° C]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
One or more months have internal surface condensation temperature not verified. Please revise the assembly.													
Mold growth R _{si} 0,25 [° C]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
One or more months have internal surface mould growth temperature below the mould growth surface temperature													
f _{Rsi}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Temp. factor at the internal surface	One or more months have the temperature factor at the internal surface not verified. Please revise the assembly.												
Ma [g/m²month]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Max acc. Moisture content	Condensation is completely evaporated												
Ma [g/m²month]												Yes	
Moisture evaporation	Maximum accumulation of condensate does not exceed the Ma limit												
Drying potential												Yes	
Over 10 years	The drying potential of building component is verified over a period of 10 years.												





Appendix 2: Thermal simulations | Wärmestromsimulationen

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Wall, roof | Wand, Dach

Windows | Fenster

Ground | Boden

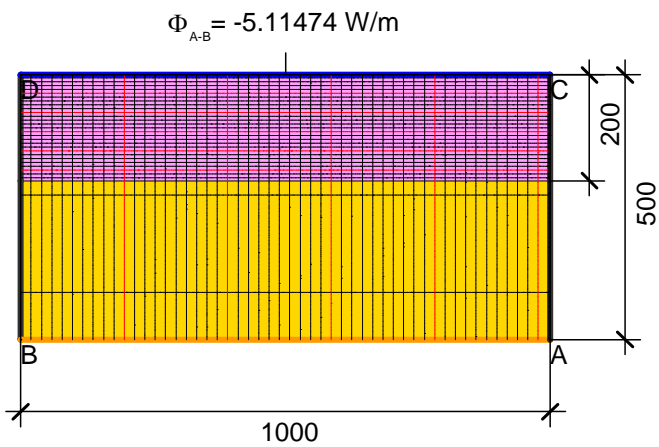


Passive House Institute

Wall, roof, ground | Wand, Dach, Boden



Flat Roof - RO1 (section 1)



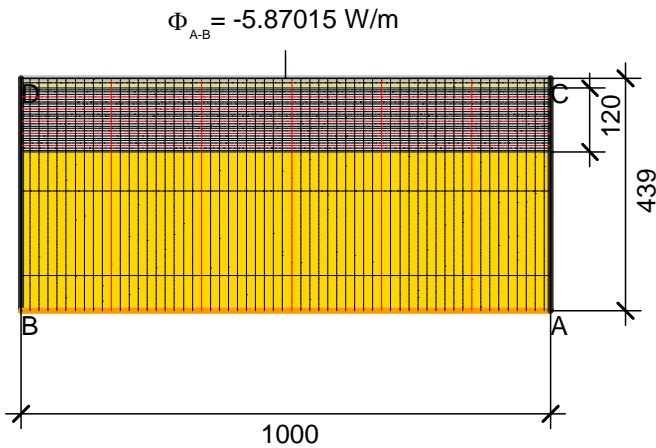
Material	λ [W/(m·K)]	ϵ
Clay slab filler block (300 mm; RT 0,32 m ² ·K/W)	0.938	0.900
XPS 038	0.037	0.900

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiabat	0.000			
Exterior Außen		-10.000	0.040	
Interior up. Innen auf.		20.000	0.100	

$$U_{\text{eq A-B}} = \frac{\Phi}{\Delta T \cdot b} = \frac{5.115}{30.0 \cdot 1.0} = 0.170 \text{ W/(m}^2 \cdot \text{K)}$$



Pitched Roof - RO2 (section 1)



Material	λ [W/(m·K)]	ϵ
Clay slab filler block (300 mm; RT 0,32 m ² ·K/W)	0.938	0.900
Onduline PIR 027	0.027	0.900
Softwood, OSB I Weichholz, OSB 10456	0.130	0.900

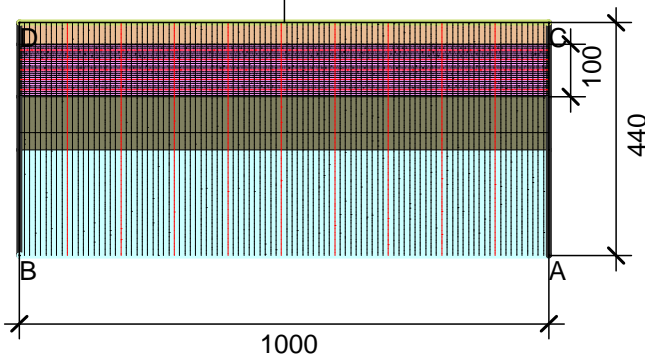
Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiabat	0.000			
Exterior roof Außen Dach		-10.000	0.100	
Interior up. Innen auf.		20.000	0.100	

$$U_{eq A-B} = \frac{\Phi}{\Delta T \cdot b} = \frac{5.87}{30.0 \cdot 1.0} = 0.196 \text{ W/(m}^2 \cdot \text{K)}$$



Floor slab - FS1

$$\Phi_{A-B} = 9.89541 \text{ W/m}$$



Material	λ [W/(m·K)]	ε
Cement screed Zement-Estrich 4108	1.400	0.900
Concrete, 1% Steel Beton, 1% Stahl 10456	2.300	0.900
Eq_ventilated crawl space	2.300	0.900
XPS 038	0.037	0.900

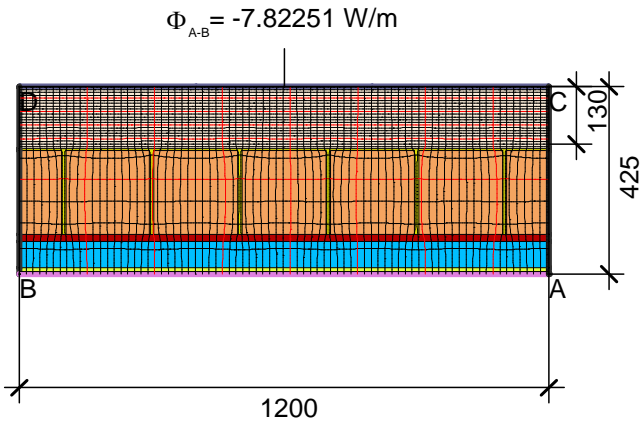
Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ε
Adiabatic Adiabat	0.000			
Gorund Erdreich		-10.000		
Int. flux down Innen abwärts		20.000	0.170	

$$U_{\text{eq A-B}} = \frac{\Phi}{\Delta T \cdot b} = \frac{9.895}{30.0 \cdot 1.0} = 0.330 \text{ W/(m}^2 \cdot \text{K)}$$



External wall 1 - EW1

Vertical section



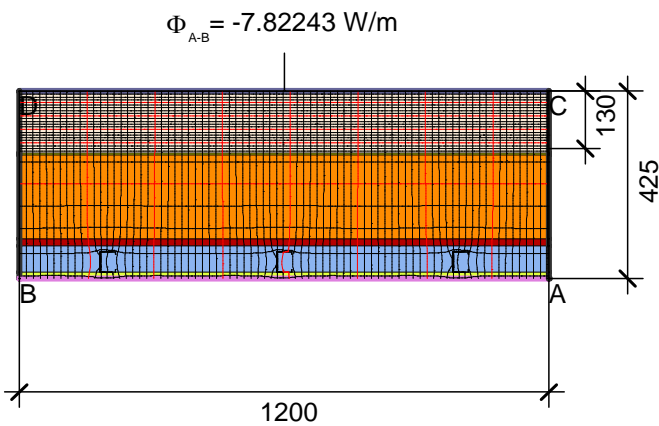
Material	λ [W/(m·K)]	ϵ
EQ_EW1 Air layer, unvent, horiz, thickness 60 mm + steel studs	0.361	0.900
Gypsum board Gipskartonplatten 900 kg/m ³ 10456	0.250	0.900
Interior plaster Gipsputz 10456	0.570	0.900
Mineral wool 040	0.040	0.900
Mörtel, Zement, Sand	1.000	0.900
Thermoclay blocks 19 cm	0.292	0.900

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Interior Innen		20.000	0.130	

$$U_{eq\ A-B} = \frac{\Phi}{\Delta T \cdot b} = \frac{7.823}{30.0 \cdot 1.2} = 0.217 \text{ W/(m}^2 \cdot \text{K)}$$

External wall 1 - EW1

Horizontal section: Thermoclay blocks - no head mortar joints (vertical)

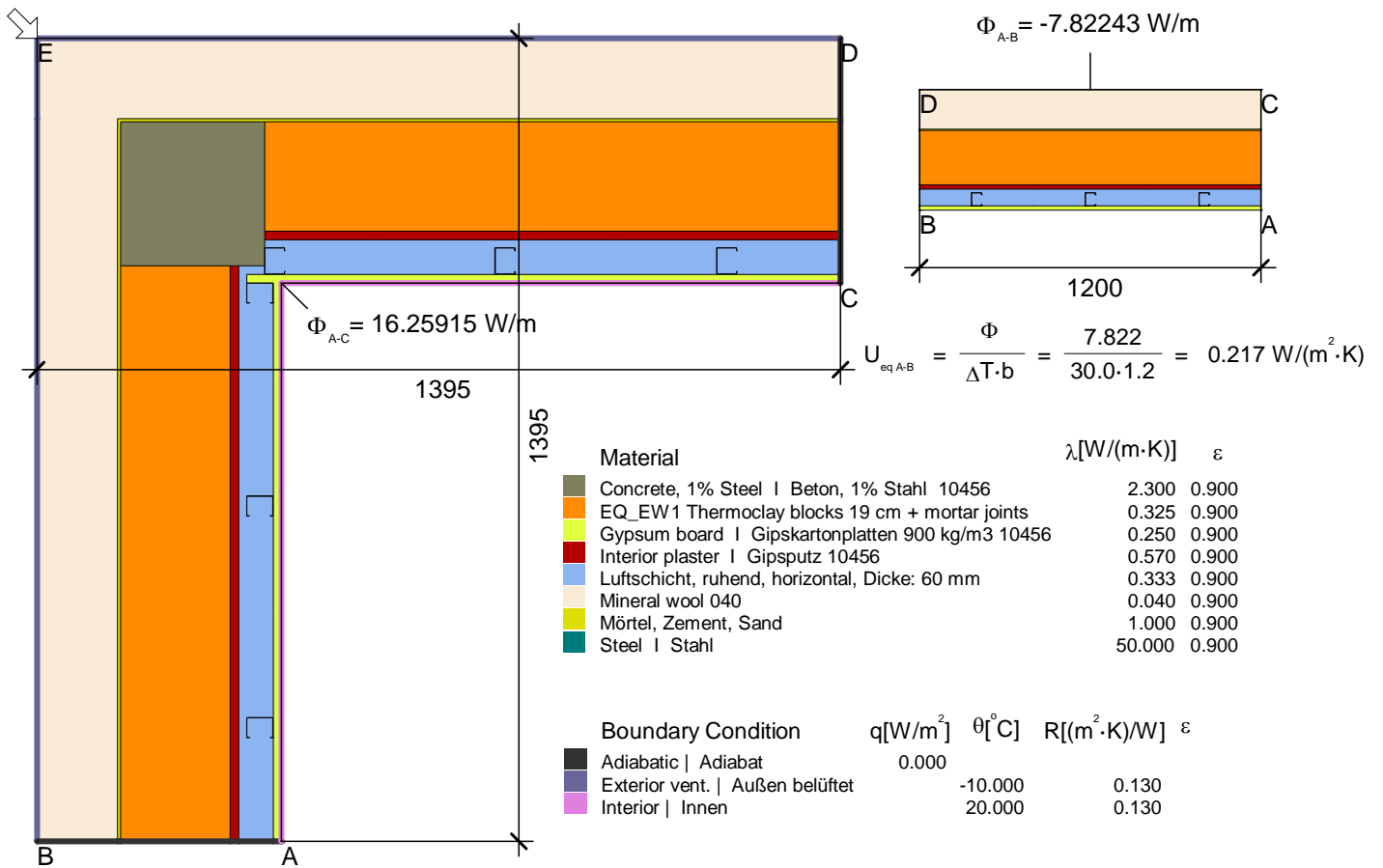


Material	λ [W/(m·K)]	ϵ
EQ_EW1 Thermoclay blocks 19 cm + mortar joints	0.325	0.900
Gypsum board Gipskartonplatten 900 kg/m ³ 10456	0.250	0.900
Interior plaster Gipsputz 10456	0.570	0.900
Luftschicht, ruhend, horizontal, Dicke: 60 mm	0.333	0.900
Mineral wool 040	0.040	0.900
Mörtel, Zement, Sand	1.000	0.900
Steel Stahl	50.000	0.900

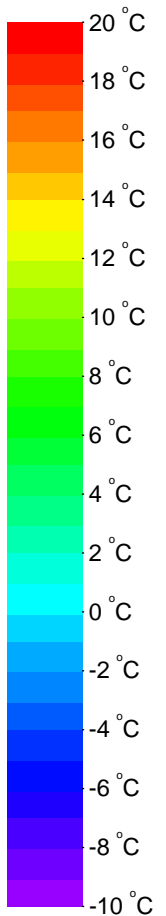
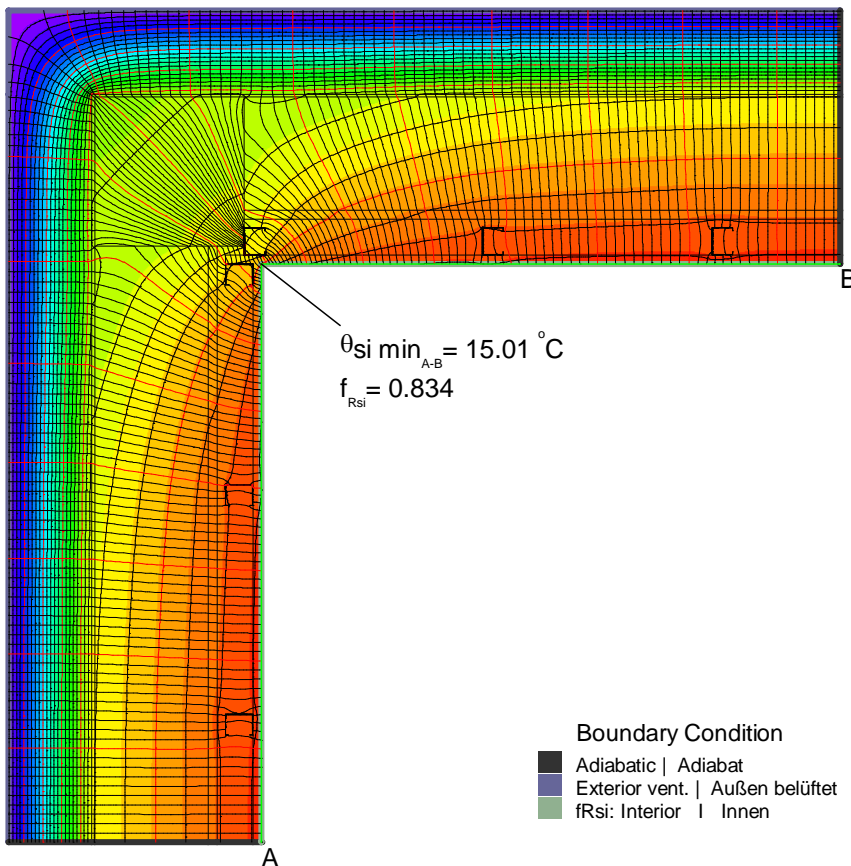
Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Interior Innen		20.000	0.130	

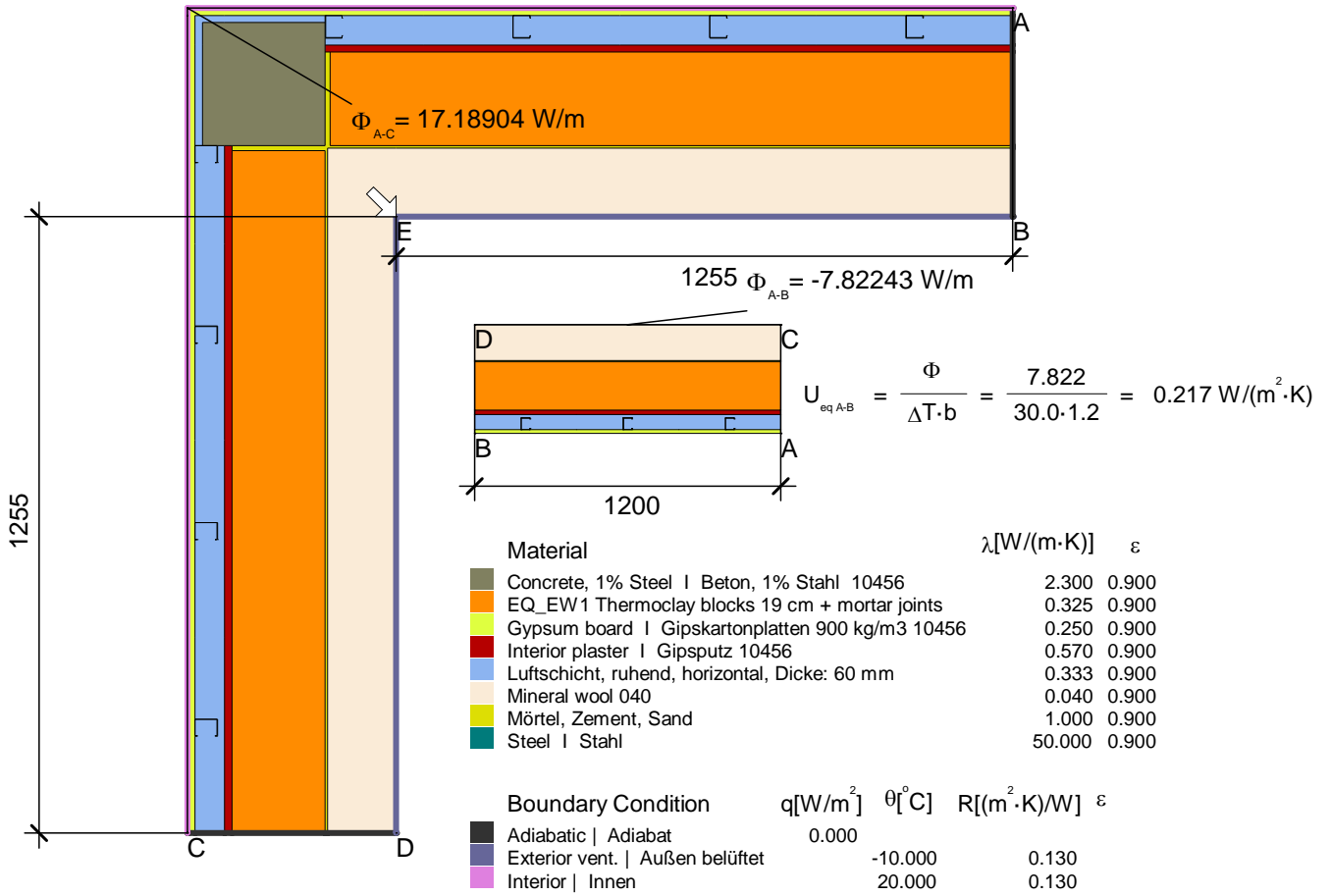
$$U_{eq\ A-B} = \frac{\Phi}{\Delta T \cdot b} = \frac{7.822}{30.0 \cdot 1.2} = 0.217 \text{ W/(m}^2 \cdot \text{K)}$$



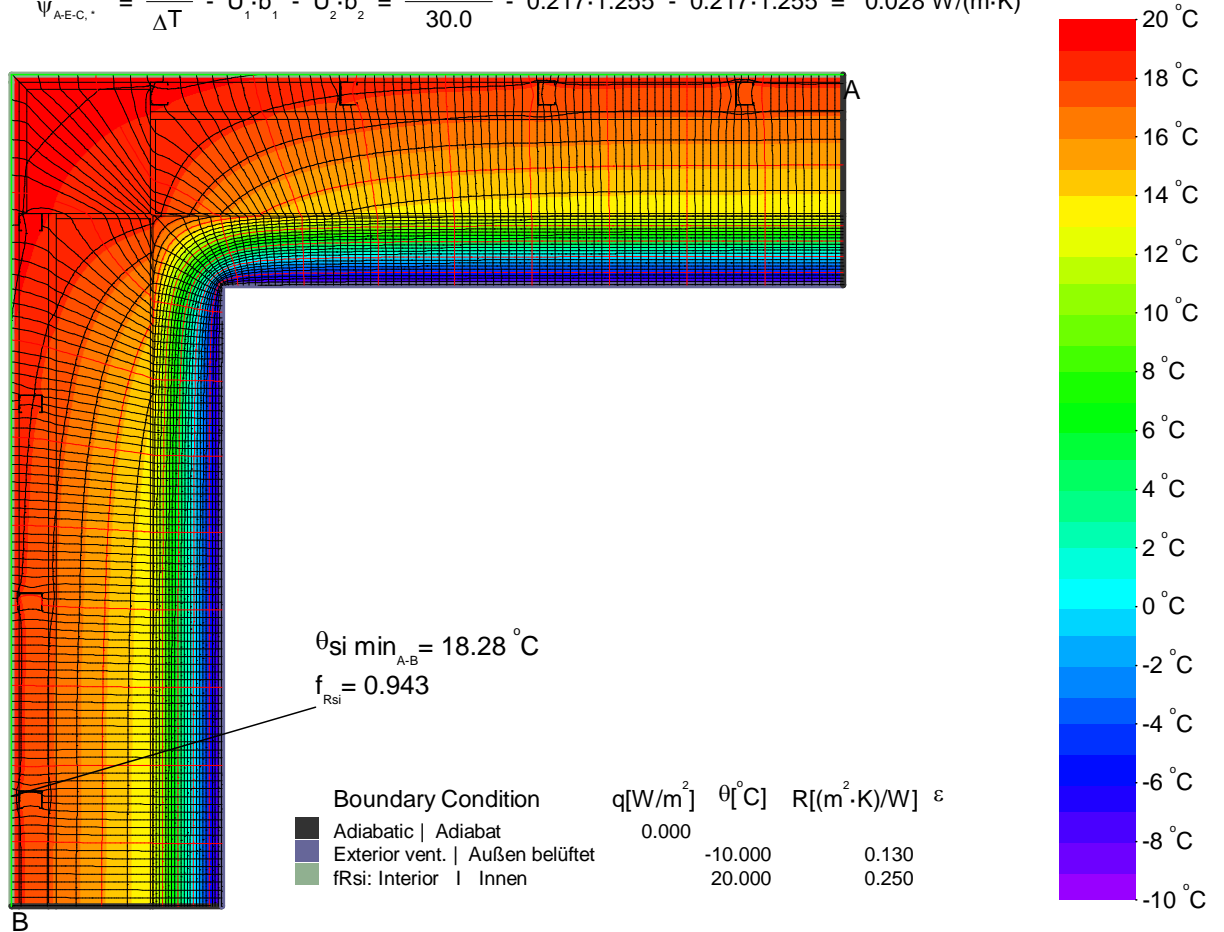


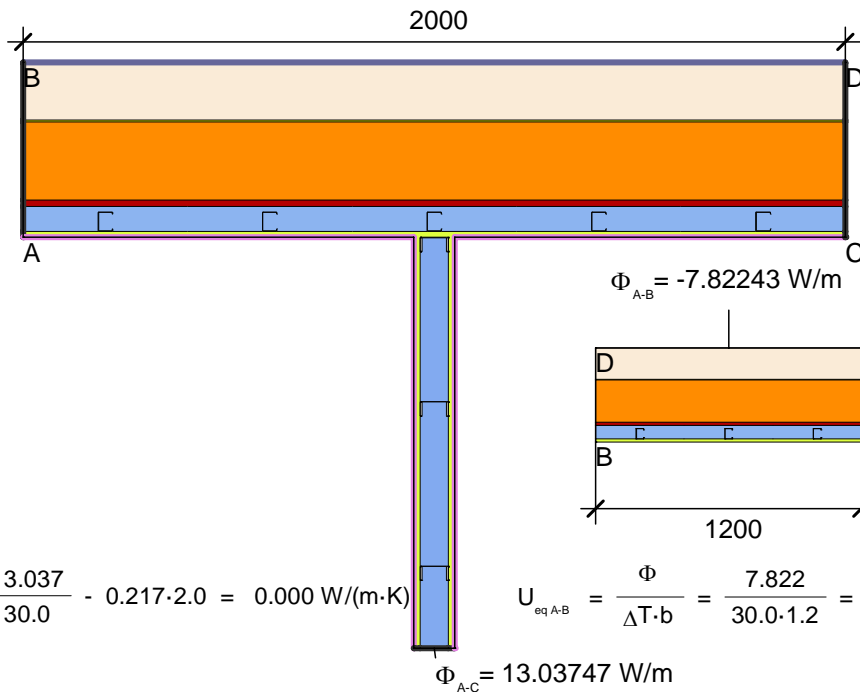
$$\psi_{A-E,C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{16.259}{30.0} - 0.217 \cdot 1.395 - 0.217 \cdot 1.395 = -0.064 \text{ W}/(\text{m} \cdot \text{K})$$





$$\psi_{A-E-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{17.189}{30.0} - 0.217 \cdot 1.255 - 0.217 \cdot 1.255 = 0.028 \text{ W/(m·K)}$$





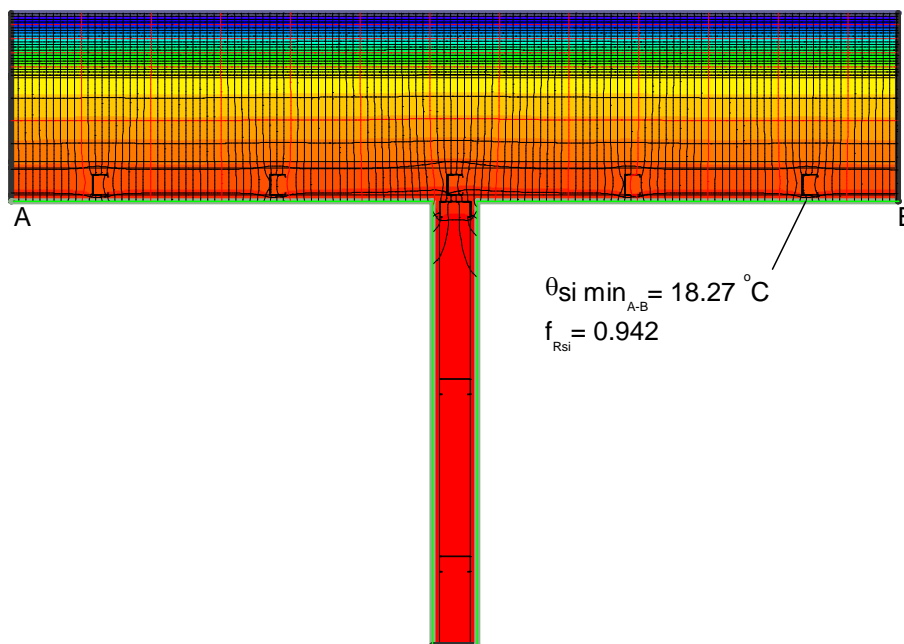
$$\psi_{A-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 = \frac{13.037}{30.0} - 0.217 \cdot 2.0 = 0.000 \text{ W}/(\text{m} \cdot \text{K})$$

$$U_{\text{eq A-B}} = \frac{\Phi}{\Delta T \cdot b} = \frac{7.822}{30.0 \cdot 1.2} = 0.217 \text{ W}/(\text{m}^2 \cdot \text{K})$$

$$\Phi_{A-C} = 13.03747 \text{ W}/\text{m}$$

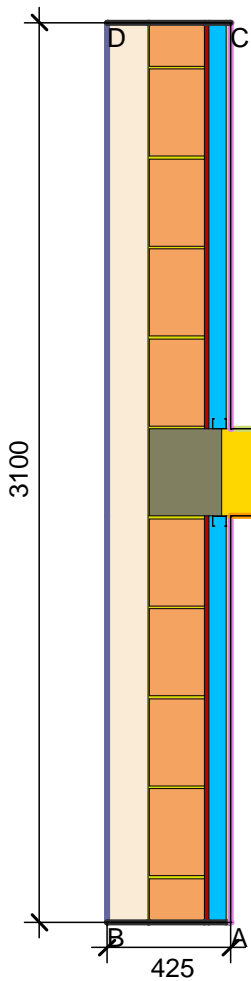
Material	λ [W/(m·K)]	ϵ
EQ_EW1 Thermoclay blocks 19 cm + mortar joints	0.325	0.900
Gypsum board Gipskartonplatten 900 kg/m ³ 10456	0.250	0.900
Interior plaster Gipsputz 10456	0.570	0.900
Luftschicht, ruhend, horizontal, Dicke: 60 mm	0.333	0.900
Luftschicht, ruhend, horizontal, Dicke: 70 mm	0.389	0.900
Mineral wool 040	0.040	0.900
Mörtel, Zement, Sand	1.000	0.900
Steel Stahl	50.000	0.900
Unvent. cavity unbel. Hohlr. *		
* EN ISO 10077-2:2017, 6.4.2		

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet	-10.000	0.130		
Interior Innen	20.000	0.130		
e 0,9 Cavity Hohlraum			0.900	



Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet	-10.000	0.130		
fRsi: Interior Innen	20.000	0.250		



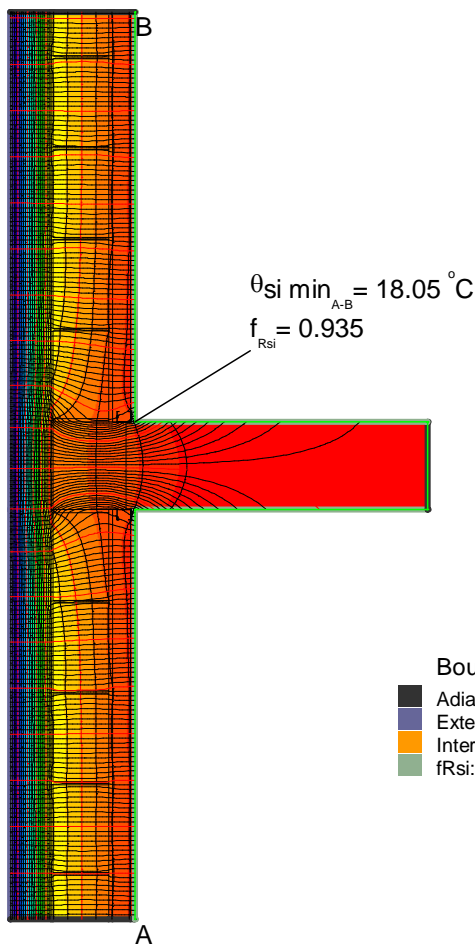


$$\psi_{A-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 = \frac{20.618}{30.0} - 0.217 \cdot 3.1 = 0.014 \text{ W/(m}\cdot\text{K)}$$

$$\Phi_{A-C} = 20.61837 \text{ W/m}$$

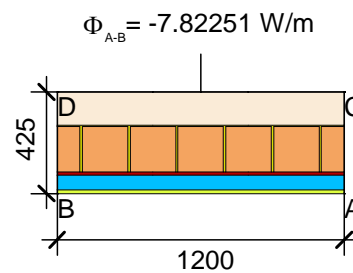
Material	λ [W/(m·K)]	ϵ
Clay slab filler block (300 mm; RT 0,32 m ² ·K/W)	0.938	0.900
Concrete, 1% Steel Beton, 1% Stahl 10456	2.300	0.900
EQ_EW1 Air layer, unvent, horiz, thickness 60 mm + steel studs	0.361	0.900
Gypsum board Gipskartonplatten 900 kg/m ³ 10456	0.250	0.900
Interior plaster Gipsputz 10456	0.570	0.900
Mineral wool 040	0.040	0.900
Mörtel, Zement, Sand	1.000	0.900
Steel Stahl	50.000	0.900
Thermoclay blocks 19 cm	0.292	0.900

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Int. flux down Innen abwärts		20.000	0.170	
Interior up. Innen auf.		20.000	0.100	
Interior Innen		20.000	0.130	



$$\theta_{si \text{ min}}_{A-B} = 18.05 \text{ }^\circ\text{C}$$

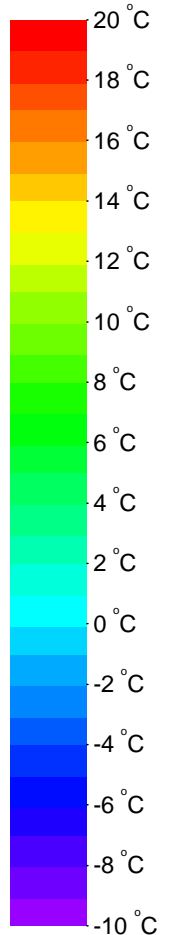
$$f_{Rsi} = 0.935$$

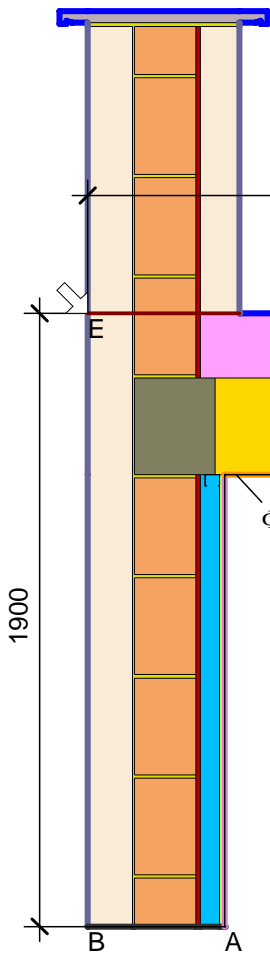


$$\Phi_{A-B} = -7.82251 \text{ W/m}$$

$$U_{eq \text{ A-B}} = \frac{\Phi}{\Delta T \cdot b} = \frac{7.823}{30.0 \cdot 1.2} = 0.217 \text{ W/(m}^2\text{·K)}$$

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Interior up. Innen auf.		20.000	0.100	
fRsi: Interior Innen		20.000	0.250	





$$\psi_{A-E-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{22.292}{30.0} - 0.217 \cdot 1.9 - 0.17 \cdot 1.895 = 0.007 \text{ W/(m}\cdot\text{K)}$$

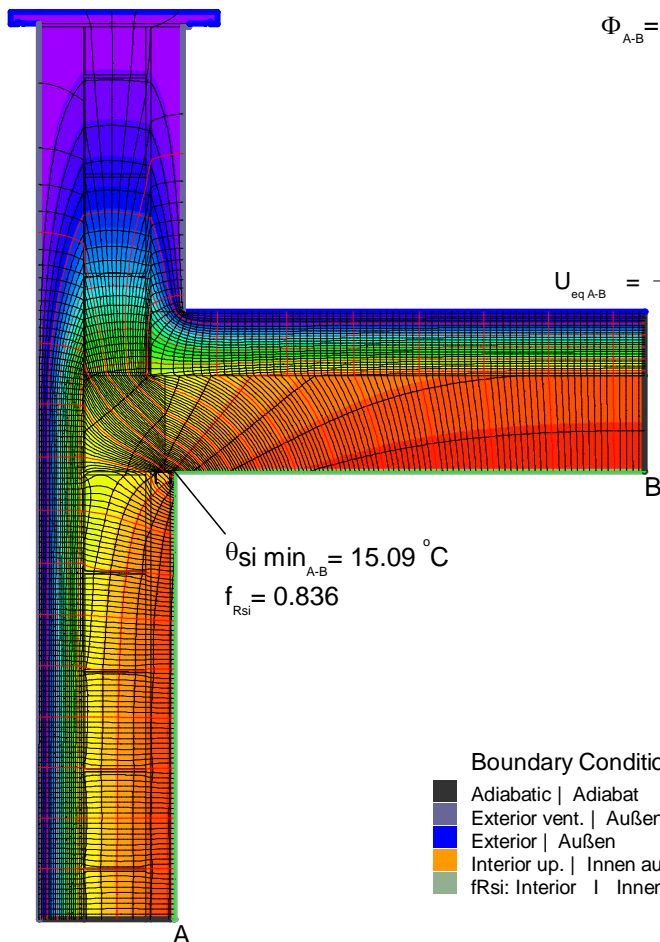
$$U = 0.170 \text{ W/(m}^2\cdot\text{K)}$$

$$\Phi_{A-C} = 22.29225 \text{ W/m}$$

Material

Material	λ [W/(m·K)]	ϵ
Clay slab filler block (300 mm; RT 0,32 m ² ·K/W)	0.938	0.900
Concrete, 1% Steel Beton, 1% Stahl 10456	2.300	0.900
EQ_EW1 Air layer, unvent, horiz, thickness 60 mm + steel studs	0.361	0.900
Gypsum board Gipskartonplatten 900 kg/m ³ 10456	0.250	0.900
Interior plaster Gipsputz 10456	0.570	0.900
Mineral wool 040	0.040	0.900
Mörtel, Zement, Sand	1.000	0.900
Sand-lime stone Kalksandstein 1745	1.000	0.900
Steel Stahl	50.000	0.900
Thermoclay blocks 19 cm	0.292	0.900
XPS 038	0.037	0.900

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Exterior Außen		-10.000	0.040	
Interior up. Innen auf.		20.000	0.100	
Interior Innen		20.000	0.130	



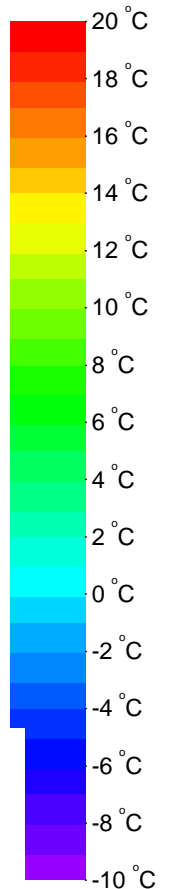
$$\Phi_{A-B} = -7.82251 \text{ W/m}$$

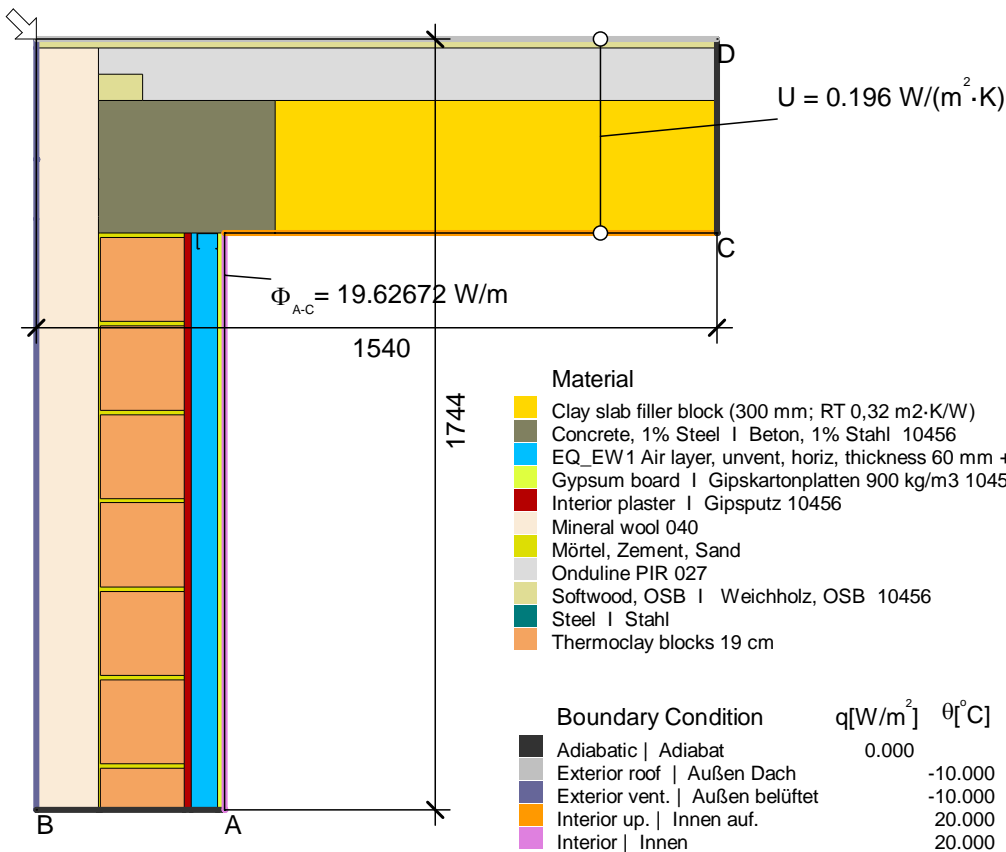
$$U_{eq-A-B} = \frac{\Phi}{\Delta T \cdot b} = \frac{7.823}{30.0 \cdot 1.2} = 0.217 \text{ W/(m}^2\cdot\text{K)}$$

$$\theta_{si \text{ min}}_{A-B} = 15.09 \text{ }^{\circ}\text{C}$$

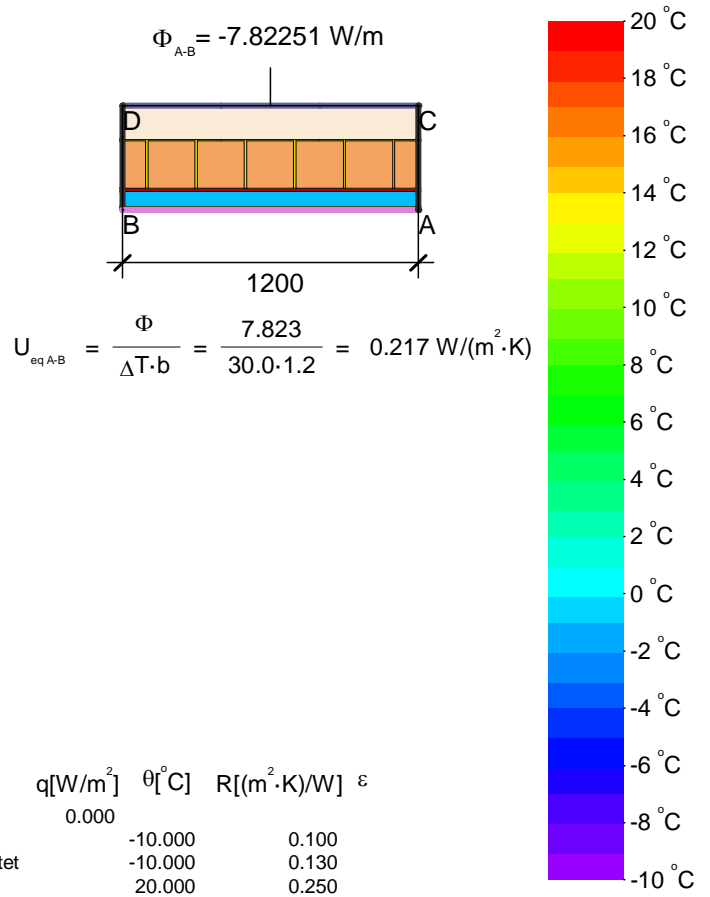
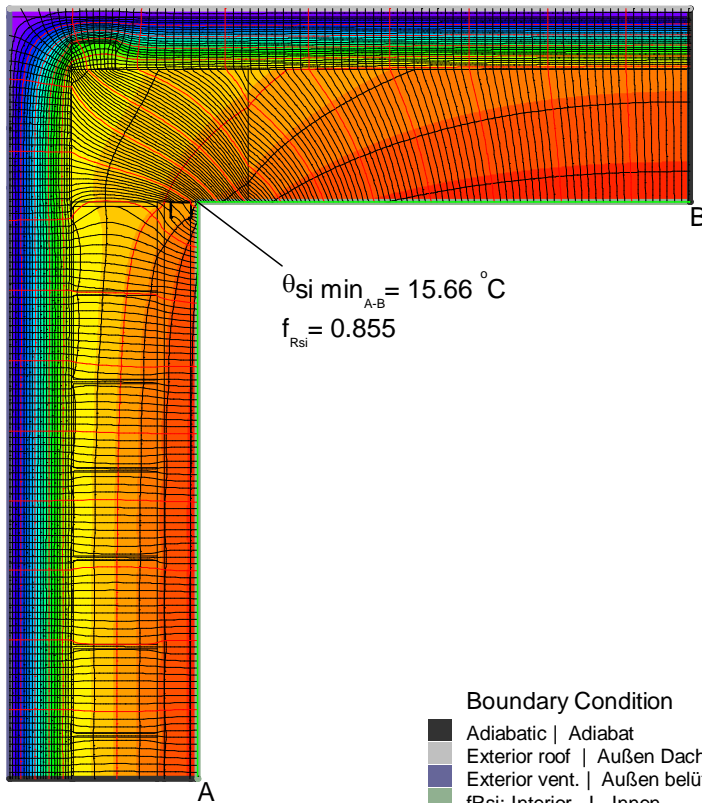
$$f_{Rsi} = 0.836$$

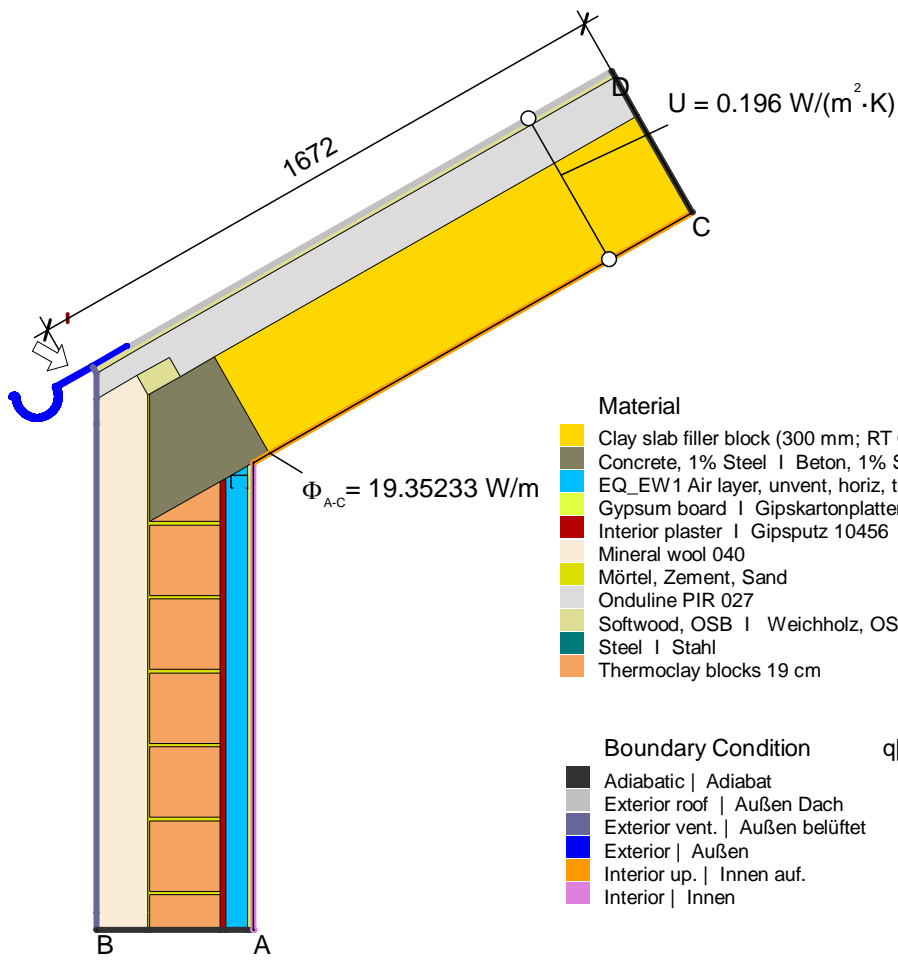
Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Exterior Außen		-10.000	0.040	
Interior up. Innen auf.		20.000	0.100	
fRsi: Interior Innen		20.000	0.250	





$$\Psi_{A-E-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{19.627}{30.0} - 0.217 \cdot 1.744 - 0.196 \cdot 1.54 = -0.026 \text{ W/(m·K)}$$

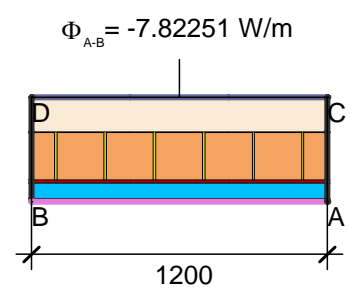
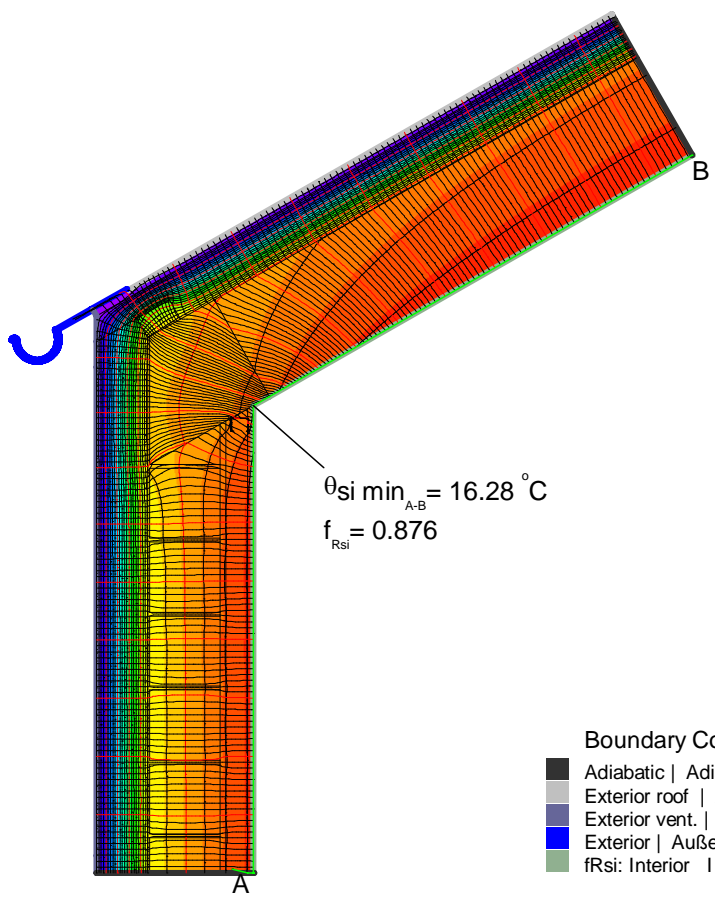




Material	λ [W/(m·K)]	ϵ
Clay slab filler block (300 mm; RT 0,32 m ² -K/W)	0.938	0.900
Concrete, 1% Steel Beton, 1% Stahl 10456	2.300	0.900
EQ_EW1 Air layer, unvent, horiz, thickness 60 mm + steel studs	0.361	0.900
Gypsum board Gipskartonplatten 900 kg/m ³ 10456	0.250	0.900
Interior plaster Gipsputz 10456	0.570	0.900
Mineral wool 040	0.040	0.900
Mörtel, Zement, Sand	1.000	0.900
Onduline PIR 027	0.027	0.900
Softwood, OSB Weichholz, OSB 10456	0.130	0.900
Steel Stahl	50.000	0.900
Thermoclay blocks 19 cm	0.292	0.900

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiatat	0.000			
Exterior roof Außen Dach		-10.000	0.100	
Exterior vent. Außen belüftet		-10.000	0.130	
Exterior Außen		-10.000	0.040	
Interior up. Innen auf.		20.000	0.100	
Interior Innen		20.000	0.130	

$$\Psi_{A-E,C,*} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{19.352}{30.0} - 0.217 \cdot 1.527 - 0.196 \cdot 1.672 = -0.014 \text{ W}/(\text{m} \cdot \text{K})$$



$$U_{\text{eq A-B}} = \frac{\Phi}{\Delta T \cdot b} = \frac{7.823}{30.0 \cdot 1.2} = 0.217 \text{ W}/(\text{m}^2 \cdot \text{K})$$

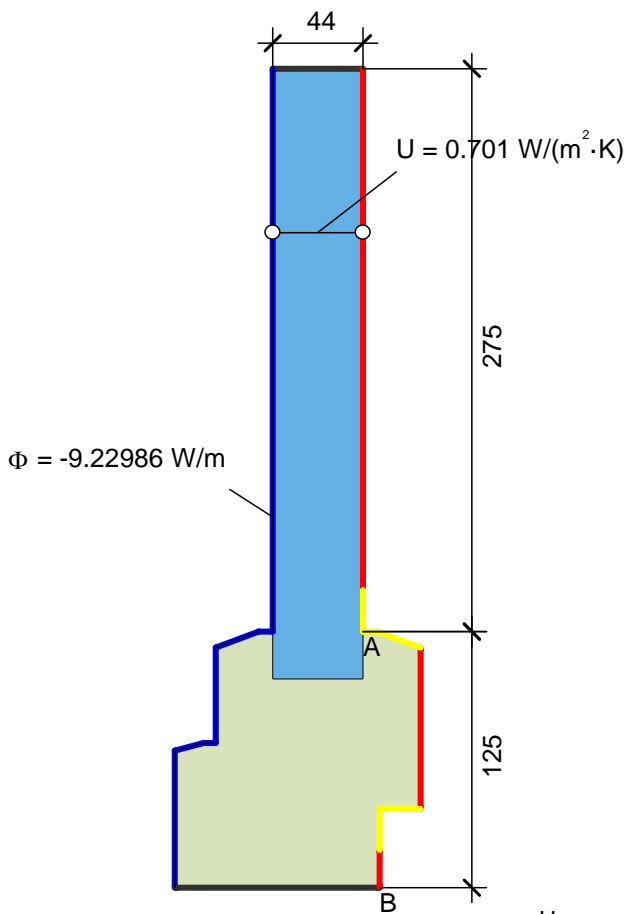
Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]
Adiabatic Adiatat	0.000		
Exterior roof Außen Dach		-10.000	0.100
Exterior vent. Außen belüftet		-10.000	0.130
Exterior Außen		-10.000	0.040
fRsi: Interior Innen		20.000	0.250



Windows | Fenster

Passive House Window		1			2			3			1	
frame values Rahmenwerte		Bottom	Top	Side	Bottom	Top	Side	Bottom	Top	Side	Bottom barrier-free	
		Unten	Oben	Seitl.	Unten	Oben	Seitl.	Unten	Oben	Seitl.	Unten barrierefrei	
	Spacer Abstandhalter: Swisspacer Ultimate with PU secondary seal											
	Frame width Rahmenbreite	b_f [mm]	125	125	125							125
	U-value frame Rahmen-U-Wert	U_f [W/(m²K)]	0,92	0,92	0,92							0,92
	Ψ-glass edge Glasrand-Ψ-Wert	Ψ_g [W/(mK)]	0,038	0,038	0,038							0,038
	U-value window Fenster-U-Wert	U_w [W/(m²K)] @ $U_g = 0,52$ W/(m²K)	1,00									
	Passive House efficiency class Passivhaus Effizienzklasse		phC									
Installation Einbau												
	$f_{Rsi=0,25m^2K/W}$	0,783	0,801	0,797							0,685	
	$\Psi_{install}$ [W/(mK)]	0,030	0,008	0,003							-0,009	
$U_{w, installed}$ [W/(m²K)]		1,03										



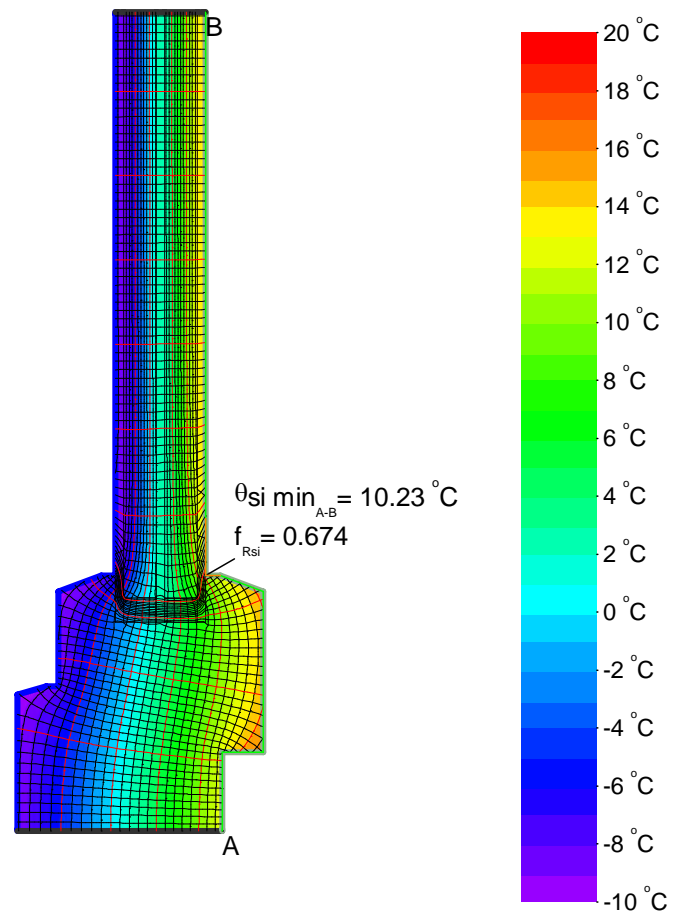
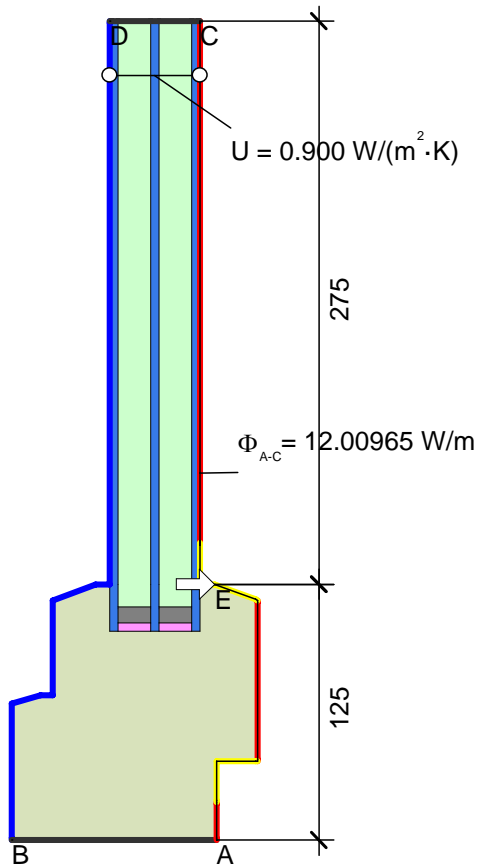


Material	λ [W/(m·K)]	ϵ
Panel Maske	0.035	0.900
Standard frame Standardrahmen	0.113	0.900

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior Außen		-10.000	0.040	
Interior, frame, normal		20.000	0.130	
Interior, frame, reduced		20.000	0.200	

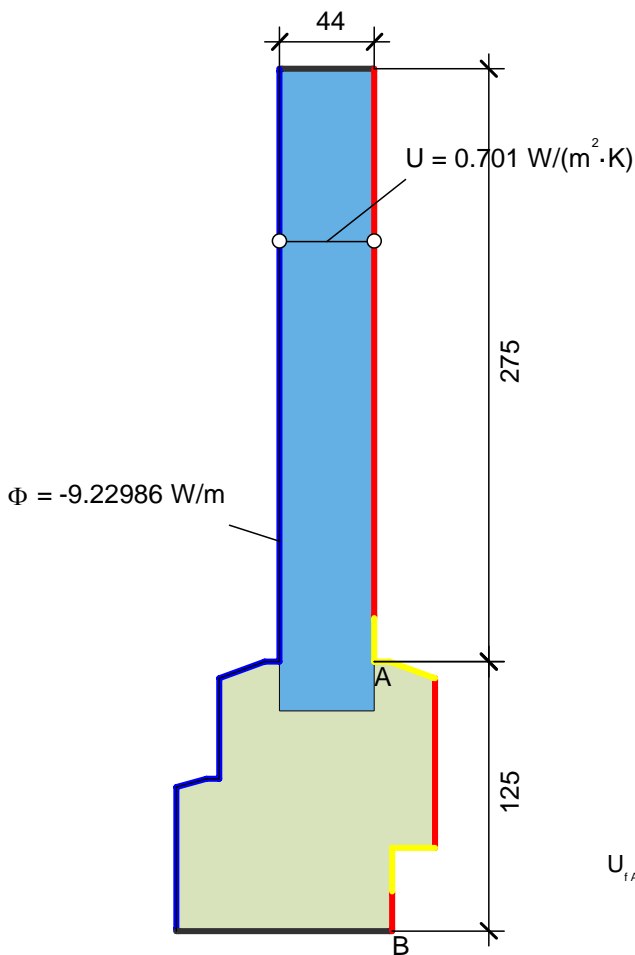
Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior Außen		-10.000	0.040	
fRsi: Interior Innen		20.000	0.250	

$$U_{f,AB} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_f} = \frac{\frac{9.23}{30.0} - 0.701 \cdot 0.275}{0.125} = 0.920 \text{ W}/(\text{m}^2 \cdot \text{K})$$



$$\Psi_{A-E,C,*} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{12.01}{30.0} - 0.92 \cdot 0.125 - 0.9 \cdot 0.275 = 0.038 \text{ W}/(\text{m} \cdot \text{K})$$



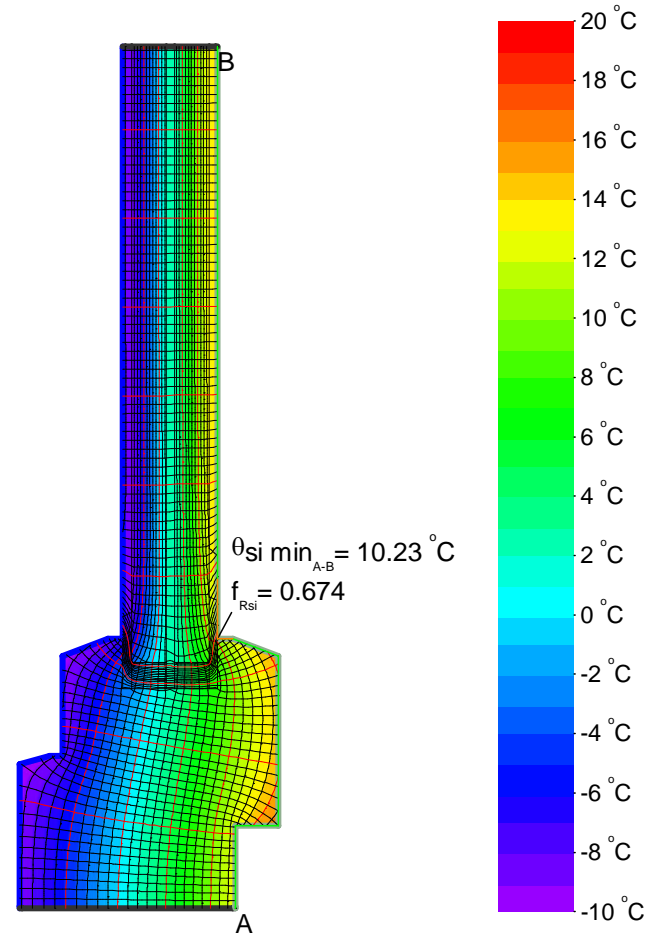
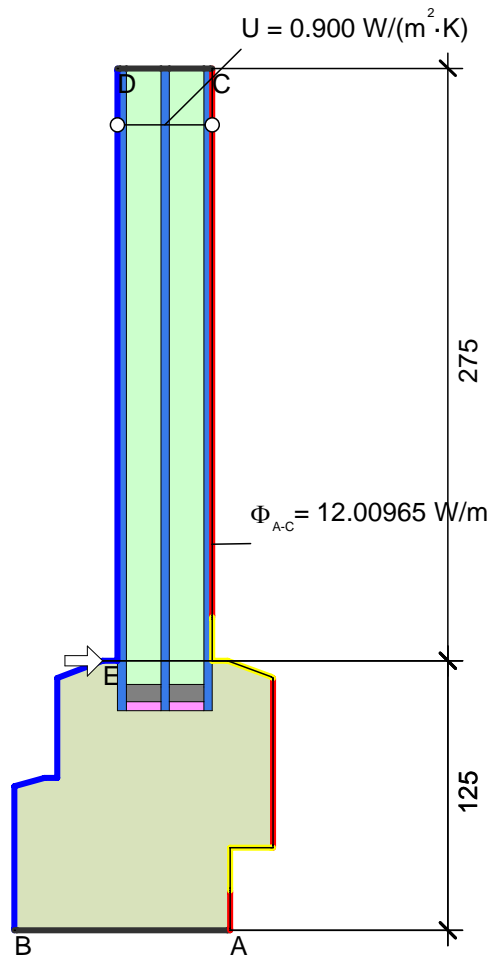


Material	λ [W/(m·K)]	ϵ
Panel Maske	0.035	0.900
Standard frame Standardrahmen	0.113	0.900

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior Außen		-10.000	0.040	
Interior, frame, normal		20.000	0.130	
Interior, frame, reduced		20.000	0.200	

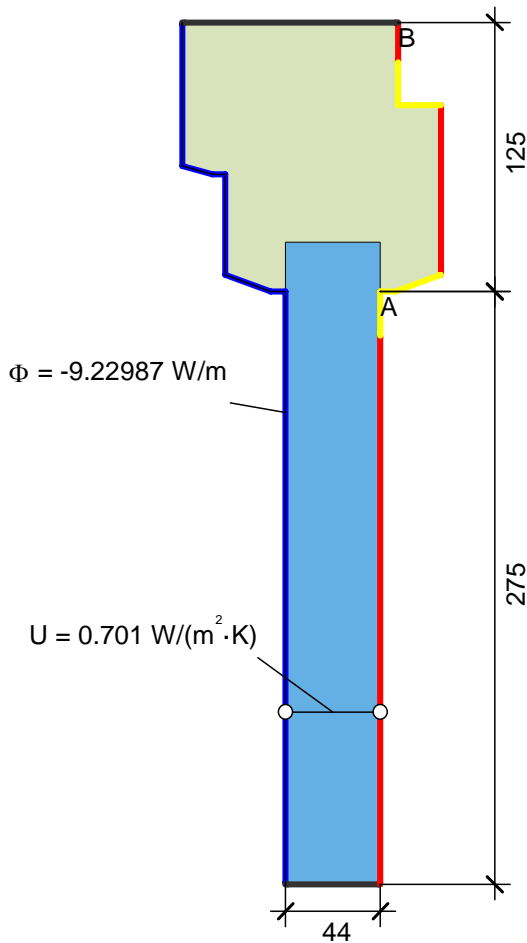
Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior Außen		-10.000	0.040	
fRsi: Interior Innen		20.000	0.250	

$$U_{f,A,B} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_i} = \frac{\frac{9.23}{30.0} - 0.701 \cdot 0.275}{0.125} = 0.920 \text{ W/(m}^2 \cdot \text{K)}$$



$$\Psi_{A-E-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{12.01}{30.0} - 0.92 \cdot 0.125 - 0.9 \cdot 0.275 = 0.038 \text{ W/(m}^2 \cdot \text{K)}$$



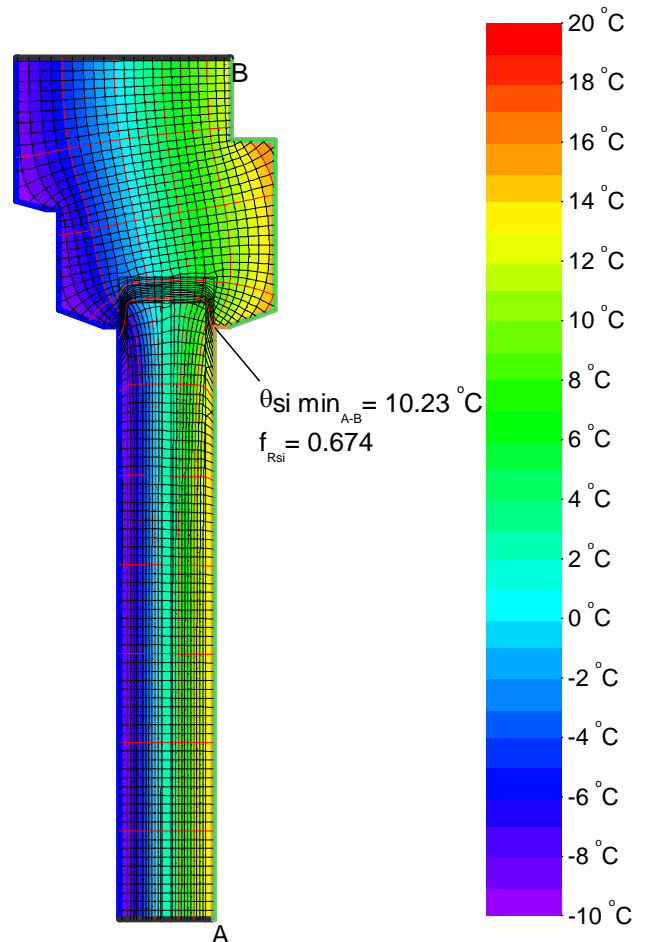
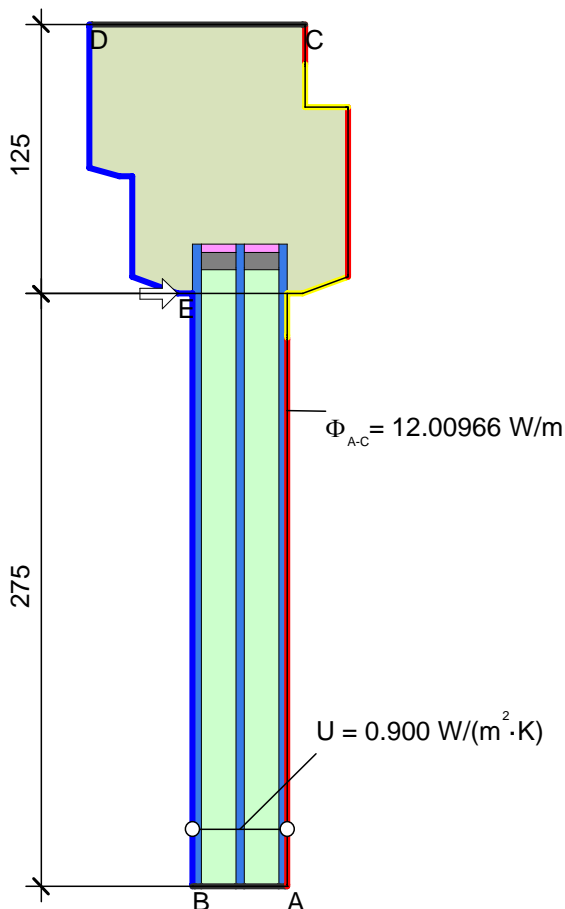


Material	λ [W/(m·K)]	ε
Panel Maske	0.035	0.900
Standard frame Standardrahmen	0.113	0.900

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ε
Adiabatic Adiabat	0.000			
Exterior Außen		-10.000	0.040	
Interior, frame, normal		20.000	0.130	
Interior, frame, reduced		20.000	0.200	

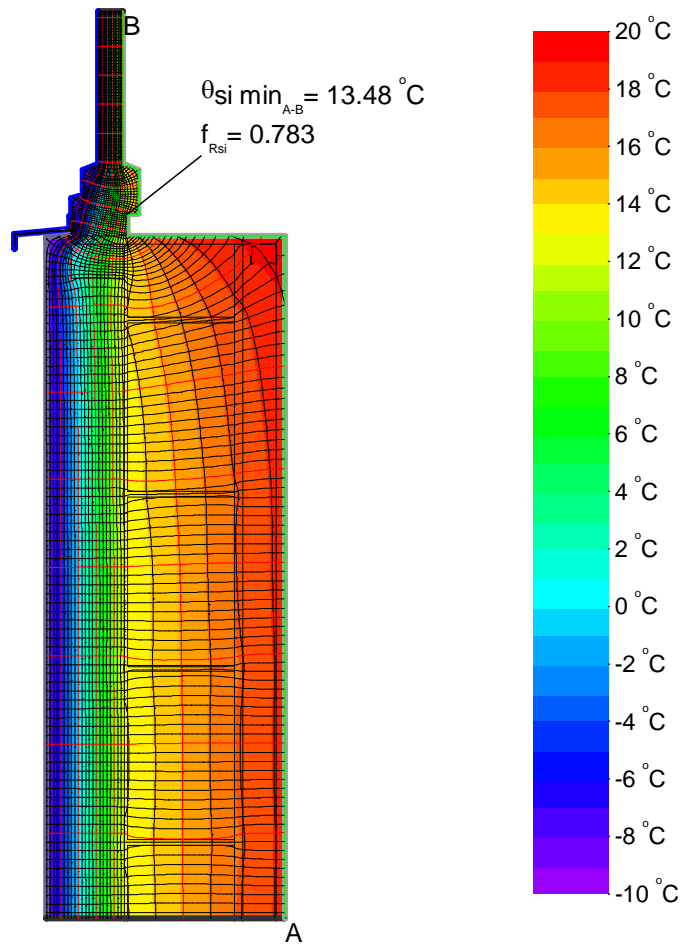
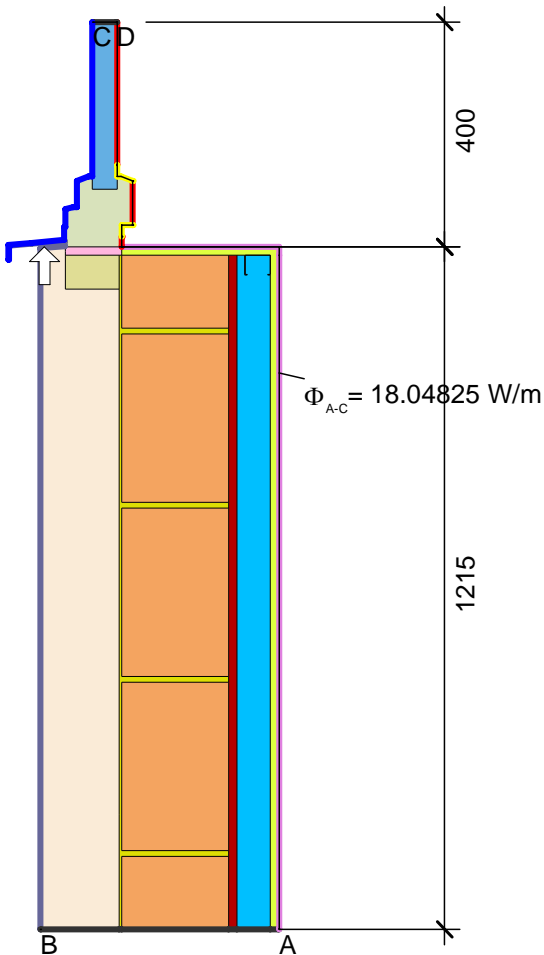
Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ε
Adiabatic Adiabat	0.000			
Exterior Außen		-10.000	0.040	
fRsi: Interior Innen		20.000	0.250	

$$U_{f,A,B} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_f} = \frac{\frac{9.23}{30.0} - 0.701 \cdot 0.275}{0.125} = 0.920 \text{ W/(m}^2 \cdot \text{K)}$$



$$\Psi_{A-E-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{12.01}{30.0} - 0.9 \cdot 0.275 - 0.92 \cdot 0.125 = 0.038 \text{ W/(m}^2 \cdot \text{K)}$$

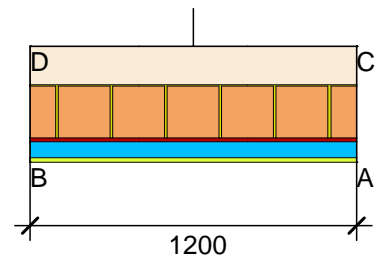




$$\psi_{A-E-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - \frac{\Phi_2}{\Delta T} = \frac{18.048}{30.0} - 0.217 \cdot 1.215 - \frac{9.23}{30.0} = 0.030 \text{ W/(m}\cdot\text{K)}$$

Material	λ [W/(m·K)]	ϵ
Aluminium Aluminium 10456	160.000	0.900
EPDM	0.250	0.900
EQ_EW1 Air layer, unvent, horiz, thickness 60 mm + steel studs	0.361	0.900
Gypsum board Gipskartonplatten 900 kg/m ³ 10456	0.250	0.900
Interior plaster Gipsputz 10456	0.570	0.900
Mineral wool 040	0.040	0.900
Mörtel, Zement, Sand	1.000	0.900
PU in-situ foam PU-Ortschaum 040	0.040	0.900
Panel Maske	0.035	0.900
Softwood, OSB Weichholz, OSB 10456	0.130	0.900
Standard frame Standardrahmen	0.113	0.900
Steel Stahl	50.000	0.900
Thermoclay blocks 19 cm	0.292	0.900

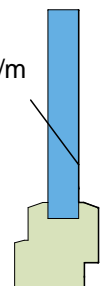
$\Phi_{A-B} = -7.82251 \text{ W/m}$

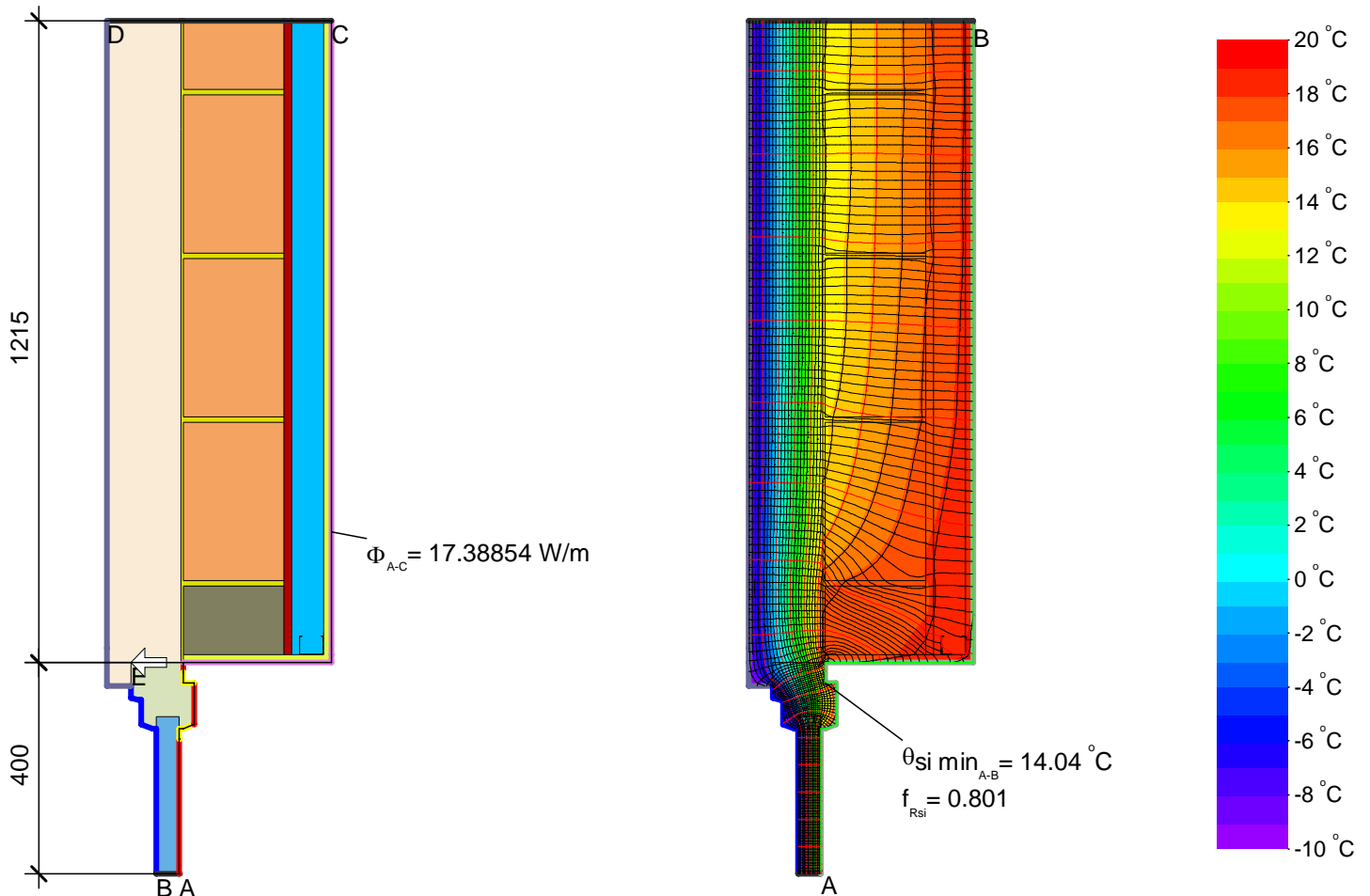


$$U_{eq \text{ A-B}} = \frac{\Phi}{\Delta T \cdot b} = \frac{7.823}{30.0 \cdot 1.2} = 0.217 \text{ W/(m}^2\cdot\text{K)}$$

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Exterior Außen		-10.000	0.040	
Interior Innen		20.000	0.130	
Interior, frame, normal		20.000	0.130	
Interior, frame, reduced		20.000	0.200	

$\Phi = 9.2299 \text{ W/m}$

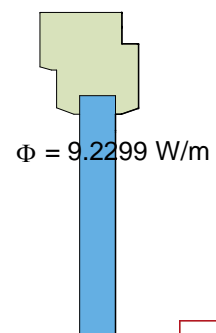
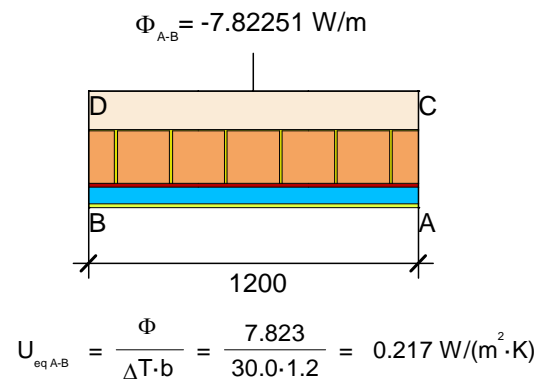


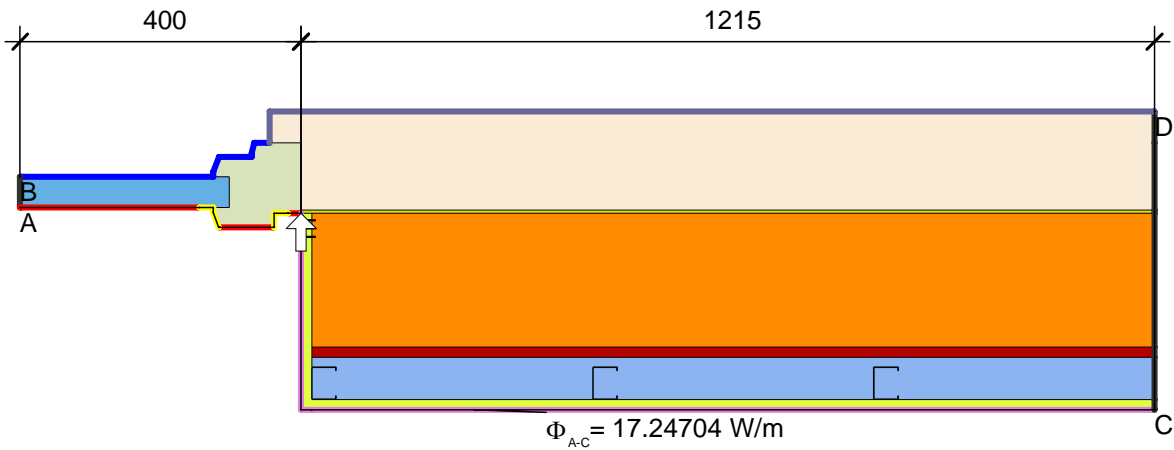


$$\psi_{A-E-C} = \frac{\Phi}{\Delta T} - \frac{\Phi_i}{\Delta T} - U_2 \cdot b_2 = \frac{17.389}{30.0} - \frac{9.23}{30.0} - 0.217 \cdot 1.215 = 0.008 \text{ W/(m}\cdot\text{K)}$$

Material	λ [W/(m·K)]	ϵ
Concrete, 1% Steel Beton, 1% Stahl 10456	2.300	0.900
EQ_EW1 Air layer, unvent, horiz, thickness 60 mm + steel studs	0.361	0.900
Gypsum board Gipskartonplatten 900 kg/m ³ 10456	0.250	0.900
Interior plaster Gipsputz 10456	0.570	0.900
Mineral wool 040	0.040	0.900
Mörtel, Zement, Sand	1.000	0.900
Panel Maske	0.035	0.900
Standard frame Standardrahmen	0.113	0.900
Steel Stahl	50.000	0.900
Thermoclay blocks 19 cm	0.292	0.900

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Exterior Außen		-10.000	0.040	
Interior Innen		20.000	0.130	
Interior, frame, normal		20.000	0.130	
Interior, frame, reduced		20.000	0.200	

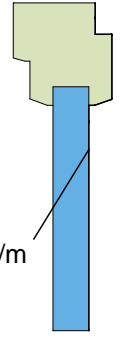




$$\Phi_{A-C} = 17.24704 \text{ W/m}$$

$$\psi_{A-E-C} = \frac{\Phi}{\Delta T} - \frac{\Phi_1}{\Delta T} - U_2 \cdot b_2 = \frac{17.247}{30.0} - \frac{9.23}{30.0} - 0.217 \cdot 1.215 = 0.003 \text{ W/(m}\cdot\text{K)}$$

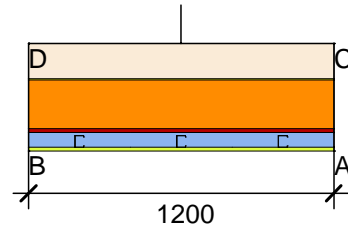
$$\phi = 9.2299 \text{ W/m}$$



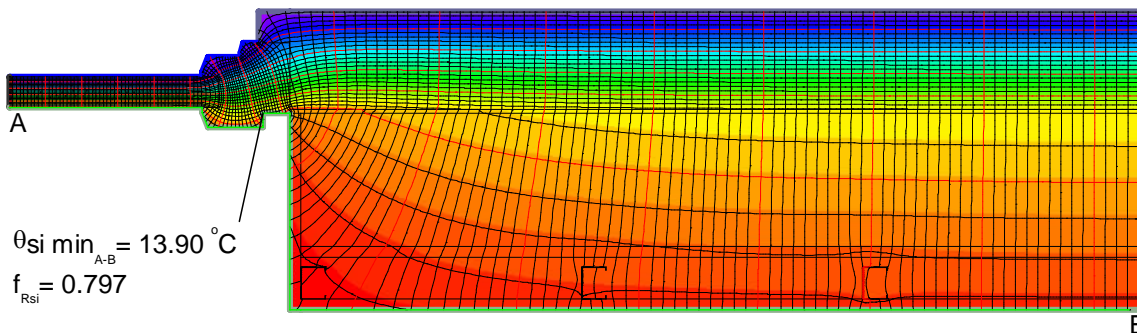
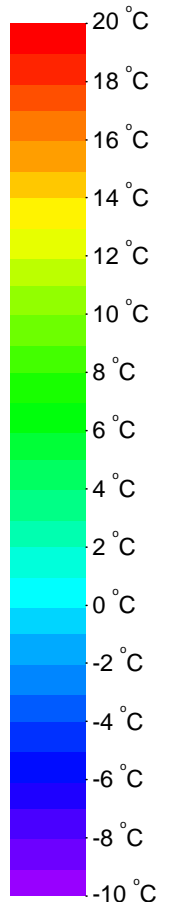
Material	λ [W/(m·K)]	ϵ
EQ_EW1 Thermoclay blocks 19 cm + mortar joints	0.325	0.900
Gypsum board Gipskartonplatten 900 kg/m ³ 10456	0.250	0.900
Interior plaster Gipsputz 10456	0.570	0.900
Luftschicht, ruhend, horizontal, Dicke: 60 mm	0.333	0.900
Mineral wool 040	0.040	0.900
Mörtel, Zement, Sand	1.000	0.900
Panel Maske	0.035	0.900
Standard frame Standardrahmen	0.113	0.900
Steel Stahl	50.000	0.900

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ϵ
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Exterior Außen		-10.000	0.040	
Interior Innen		20.000	0.130	
Interior, frame, normal		20.000	0.130	
Interior, frame, reduced		20.000	0.200	

$$\Phi_{A-B} = -7.82243 \text{ W/m}$$



$$U_{eq\ A-B} = \frac{\Phi}{\Delta T \cdot b} = \frac{7.822}{30.0 \cdot 1.2} = 0.217 \text{ W/(m}^2\cdot\text{K)}$$

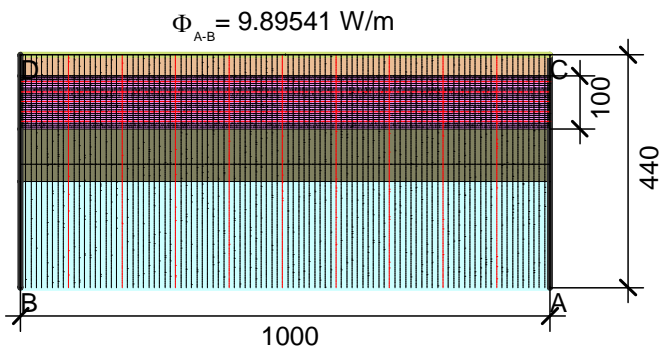


$\theta_{si\ min}_{A-B} = 13.90 \text{ }^\circ\text{C}$
 $f_{Rsi} = 0.797$



Ground | Boden

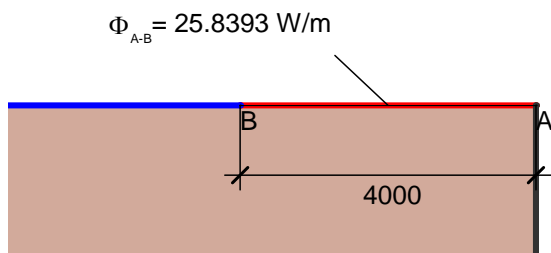




Material	$\lambda[\text{W}/(\text{m}\cdot\text{K})]$	ϵ
Cement screed Zement-Estrich 4108	1.400	0.900
Concrete, 1% Steel Beton, 1% Stahl 10456	2.300	0.900
Eq_ventilated crawl space	2.300	0.900
XPS 037	0.037	0.900

Boundary Condition	$q[\text{W}/\text{m}^2]$	$\theta[^\circ\text{C}]$	$R[(\text{m}^2\cdot\text{K})/\text{W}]$	ϵ
Adiabatic Adiatat	0.000			
Gorund Erdreich		-10.000		
Int. flux down Innen abwärts		20.000		0.170

$$U_{\text{eq A-B}} = \frac{\Phi}{\Delta T \cdot b} = \frac{9.895}{30.0 \cdot 1.0} = 0.330 \text{ W}/(\text{m}^2 \cdot \text{K})$$

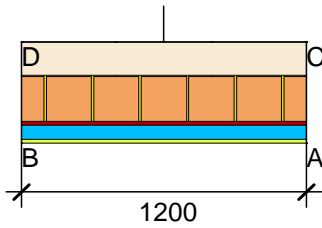


Boundary Condition	$q[\text{W}/\text{m}^2]$	$\theta[^\circ\text{C}]$	$R[(\text{m}^2\cdot\text{K})/\text{W}]$	ϵ
Adiabatic Adiatat	0.000			
EQ FS: 1/Ufs		20.000		3.030
Exterior Außen		-10.000		0.040

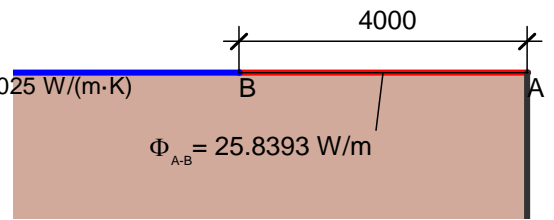


$$\psi_{A-E-C} = \frac{\Phi}{\Delta T} - \frac{\Phi_1}{\Delta T} - U_2 \cdot b_2 = \frac{40.981}{30.0} - \frac{25.839}{30.0} - 0.217 \cdot 2.44 = -0.025 \text{ W/(m}\cdot\text{K)}$$

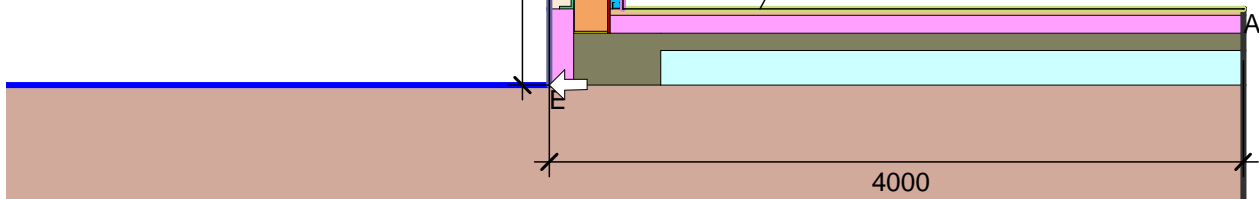
$$\Phi_{A-B} = -7.82207 \text{ W/m}$$



$$U_{eq A-B} = \frac{\Phi}{\Delta T \cdot b} = \frac{7.822}{30.0 \cdot 1.2} = 0.217 \text{ W/(m}^2\text{K)}$$

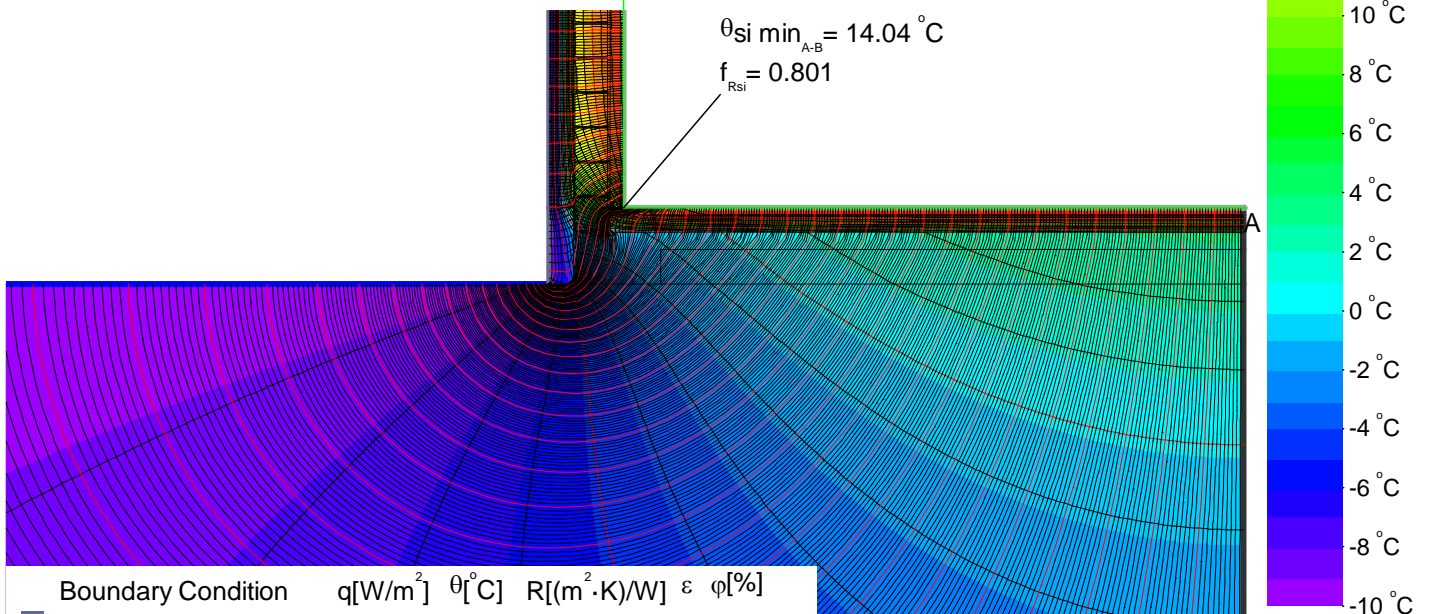


Boundary Condition	q[W/m ²]	θ[°C]	R[(m ² ·K)/W]	ε
Adiabatic Adiat	0.000			
EQ FS: 1/Ufs		20.000		3.030
Exterior Außen		-10.000		0.040



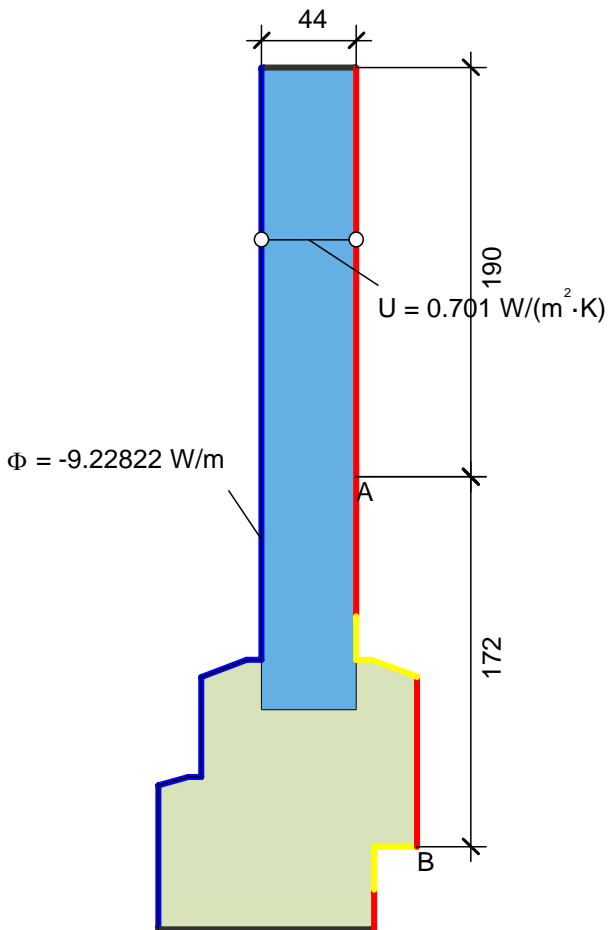
Material	λ[W/(m·K)]	ε
Air layer, unventilated, horizontal, thickness: 60 mm + steel studs	0.361	0.900
Cement screed Zement-Estrich 4108	1.400	0.900
Concrete, 1% Steel Beton, 1% Stahl 10456	2.300	0.900
Eq_ventilated crawl space	2.300	0.900
Ground Erdreich	2.000	0.900
Gypsum board Gipskartonplatten 900 kg/m3 10456	0.250	0.900
Interior plaster Gipsputz 10456	0.570	0.900
Mineral wool 040	0.040	0.900
Mörtel, Zement, Sand	1.000	0.900
PVC-U hart(Polyvinylchlorid)	0.170	0.900
Thermoclay blocks 19 cm	0.292	0.900
Steel Stahl	50.000	0.900
XPS 037	0.037	0.900

Boundary Condition	q[W/m ²]	θ[°C]	R[(m ² ·K)/W]	ε
Adiabatic Adiat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Exterior Außen		-10.000	0.040	
Int. flux down Innen abwärts		20.000	0.170	
Interior Innen		20.000	0.130	



Boundary Condition	q[W/m ²]	θ[°C]	R[(m ² ·K)/W]	ε	φ[%]
Exterior vent. Außen belüftet		-10.000	0.130		
Exterior Außen		-10.000	0.040		
fRsi: Interior Innen		20.000	0.250		
Adiabatic Adiat	0.000				



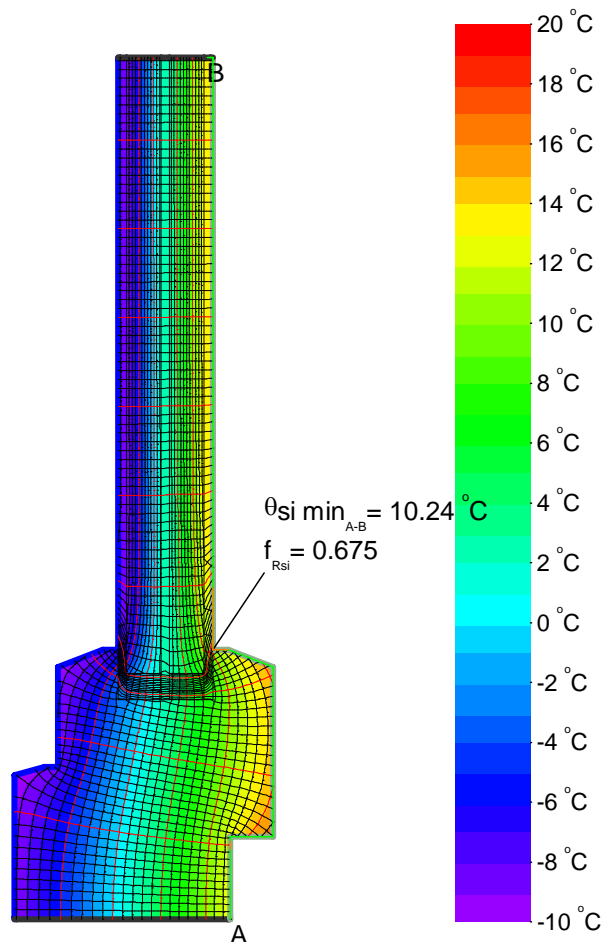
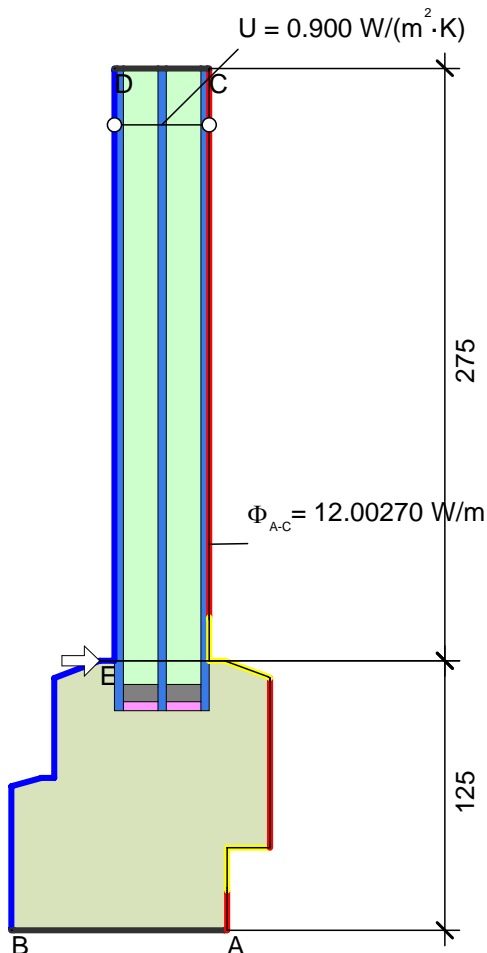


Material	λ [W/(m·K)]	ε
Panel Maske	0.035	0.900
Standard frame Standardrahmen	0.113	0.900

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ε
Adiabatic Adiat	0.000			
Exterior Außen	-10.000		0.040	
Interior, frame, normal	20.000		0.130	
Interior, frame, reduced	20.000		0.200	

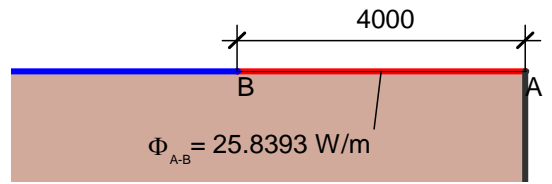
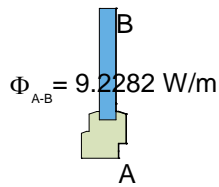
$$U_{f,AB} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_i} = \frac{\frac{9.228}{30.0} - 0.701 \cdot 0.19}{0.172} = 1.017 \text{ W/(m}^2 \cdot \text{K)}$$

Boundary Condition	q [W/m ²]	θ [°C]	R [(m ² ·K)/W]	ε
Adiabatic Adiat	0.000			
Exterior Außen	-10.000		0.040	
fRsi: Interior Innen	20.000		0.250	

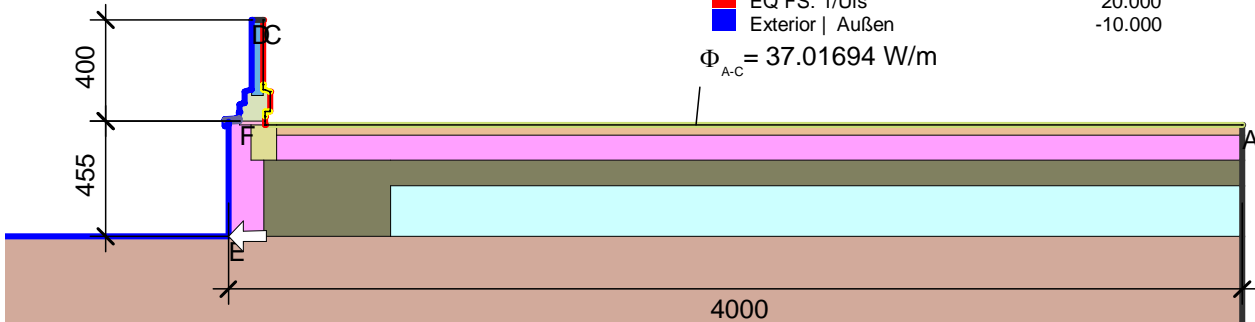


$$\Psi_{A-E-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{12.003}{30.0} - 0.919 \cdot 0.125 - 0.9 \cdot 0.275 = 0.038 \text{ W/(m}^2 \cdot \text{K)}$$



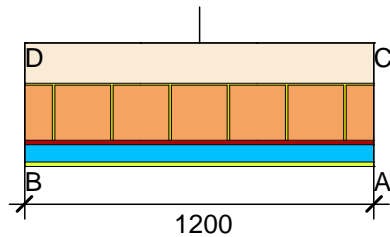


Boundary Condition	q[W/m ²]	θ[C]	R[(m ² ·K)/W]	ε
Adiabatic Adiatat	0.000			
EQ FS: 1/Ufs		20.000	3.030	
Exterior Außen		-10.000	0.040	



Material	λ[W/(m·K)]	ε
Aluminum Aluminium 10456	160.000	0.900
Cement screed Zement-Estrich 4108	1.400	0.900
Concrete, 1% Steel Beton, 1% Stahl 10456	2.300	0.900
EPDM	0.250	0.900
Eq_ventilated crawl space	2.300	0.900
Ground Erdreich	2.000	0.900
PU in-situ foam PU-Ortschaum 040	0.040	0.900
Panel Maske	0.035	0.900
Softwood, OSB Weichholz, OSB 10456	0.130	0.900
Standard frame Standardrahmen	0.113	0.900
XPS 038	0.038	0.900

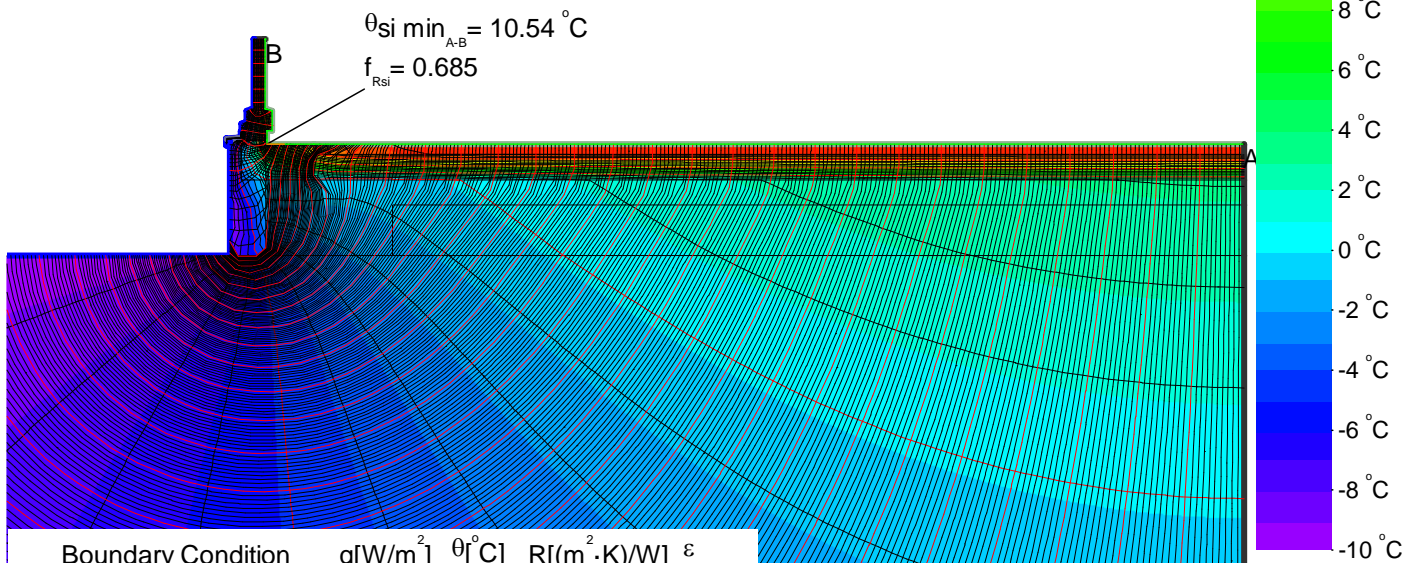
Boundary Condition	q[W/m ²]	θ[C]	R[(m ² ·K)/W]	ε
Adiabatic Adiatat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Exterior Außen		-10.000	0.040	
Int. flux down Innen abwärts		20.000	0.170	
Interior, frame, normal		20.000	0.130	
Interior, frame, reduced		20.000	0.200	



$$U_{eq\ A-B} = \frac{\Phi}{\Delta T \cdot b} = \frac{7.822}{30.0 \cdot 1.2} = 0.217 \text{ W}/(\text{m}^2 \cdot \text{K})$$

$$\Psi_{A-E,C} = \frac{\Phi}{\Delta T} - \frac{\Phi_1}{\Delta T} - U_2 \cdot b_2 - \frac{\Phi_3}{\Delta T} = \frac{37.017}{30.0} - \frac{25.839}{30.0} - 0.217 \cdot 0.455 - \frac{9.228}{30.0} = -0.034 \text{ W}/(\text{m} \cdot \text{K})$$

$$\Psi_{WITH} = \Psi_{FSEW+WITH} - \Psi_{FSEW01} = -0.080 - (-0.025) = 0.055 \text{ W}/\text{mK}$$



Boundary Condition	q[W/m ²]	θ[C]	R[(m ² ·K)/W]	ε
Adiabatic Adiatat	0.000			
Exterior vent. Außen belüftet		-10.000	0.130	
Exterior Außen		-10.000	0.040	
fRsi: Interior Innen		20.000	0.250	





Appendix 3: Manufacturers drawings | Zeichnungen des Herstellers

Passive House Institute



Passive House Institute

Exterior wall – exterior corner
Muro exterior – esquina exterior

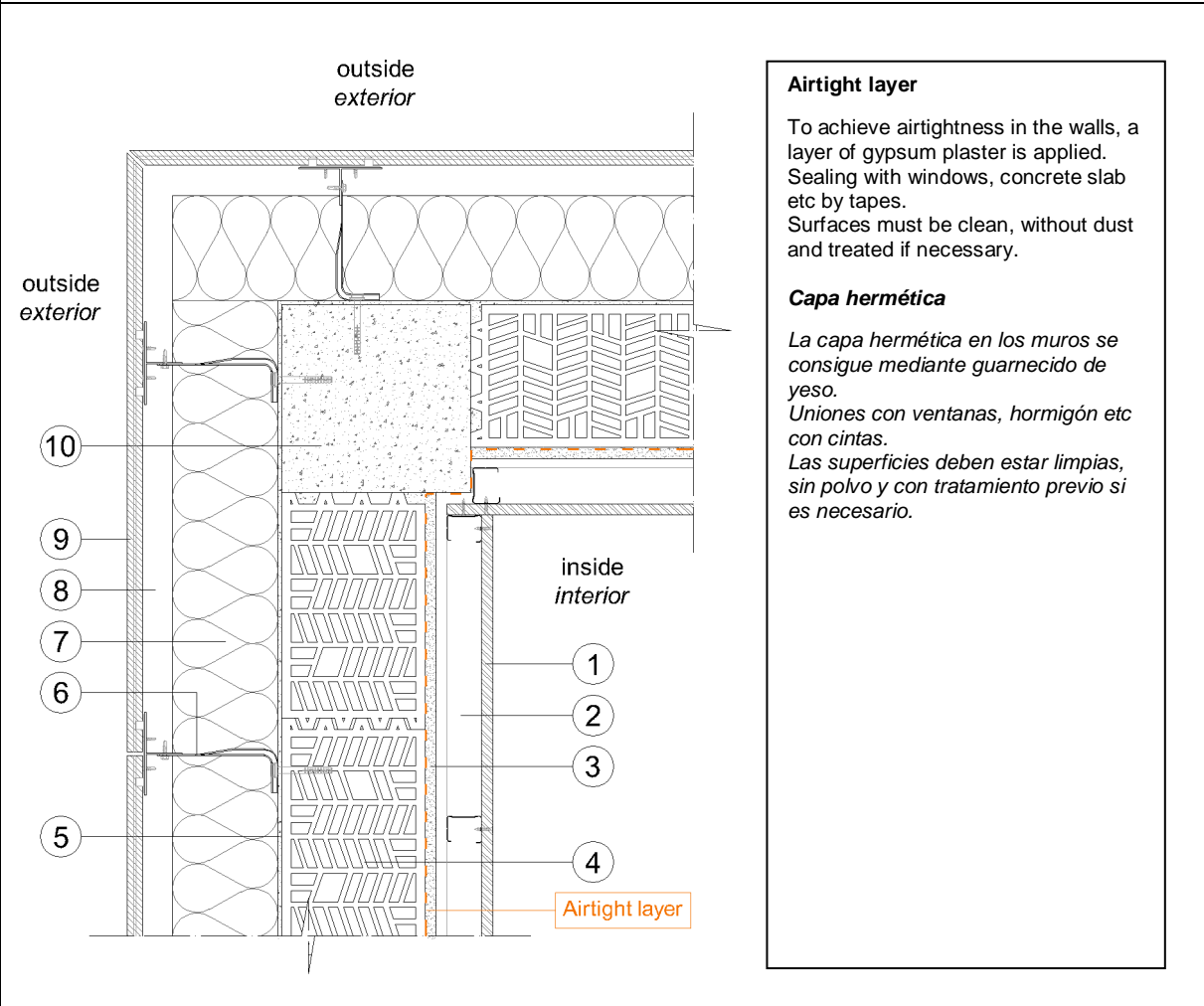
01 EW1_EW1_ec1

01 EWec



**CONSORCIO
TERMOARCILLA**

Design drawing – Horizontal cross-section / Detalle constructivo – Sección horizontal



From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]	From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]
Standard component : Exterior wall							
1	Gypsum board / Placa yeso laminado	0.250	1.5				
2	Air layer + steel studs / Cámara de aire + perfiles de acero galvanizado	0.361	6				
3	Gypsum plaster / Guarnecido de yeso	0.570	1.5				
4	Termoarcilla 19 / Termoarcilla 19	0.325	19				
5	Cement mortar / Mortero de cemento	1.000	0.5				
6	Stainless steel bracket / Ménsula de acero inoxidable	17.000	-				
7	Thermal insulation mineral wool / Aislamiento térmico lana mineral	0.040	14				
8	Air cavity / Cámara de aire ventilada	-	-				
9	Ceramic tile / Placa cerámica	-	-				
Other materials (materials not in the standard components)							
				10	Concrete column / Pilar de hormigón	2.300	-

Exterior wall – interior corner
Muro exterior – esquina interior

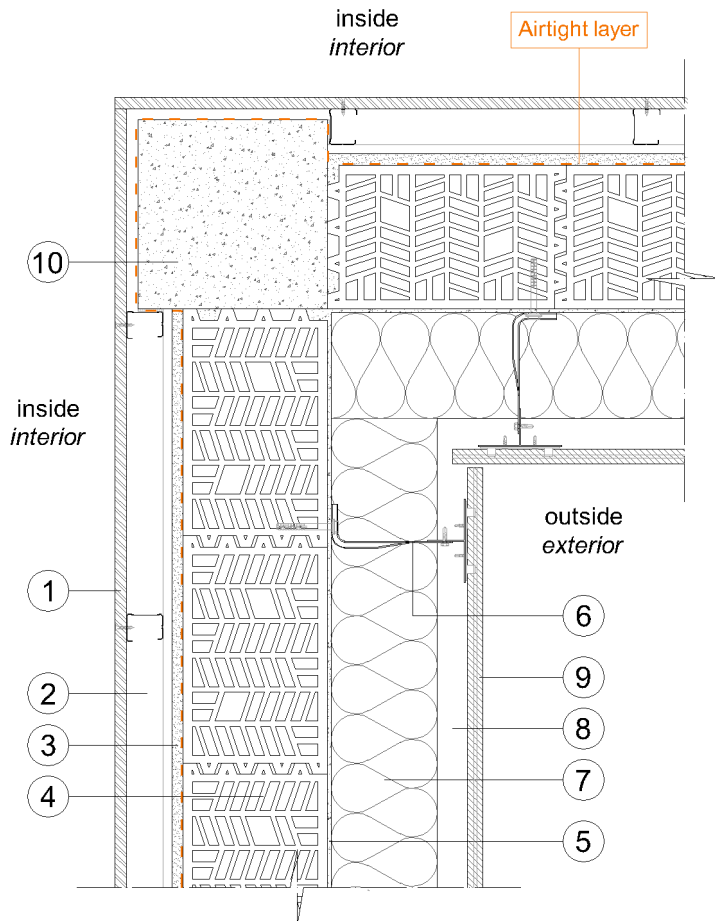
02 EW1_EW1_ic1

02 EWic



**CONSORCIO
TERMOARCILLA**

Design drawing – Horizontal cross-section / Detalle constructivo – Sección horizontal



Airtight layer

To achieve airtightness in the walls, a layer of gypsum plaster is applied. Sealing with windows, concrete slab etc by tapes. Surfaces must be clean, without dust and treated if necessary.

Capa hermética

La capa hermética en los muros se consigue mediante guarnecido de yeso. Uniones con ventanas, hormigón etc con cintas. Las superficies deben estar limpias, sin polvo y con tratamiento previo si es necesario.

From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]	From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]
Standard component : Exterior wall							
1	Gypsum board / <i>Placa yeso laminado</i>	0.250	1.5				
2	Air layer + steel studs / <i>Cámara de aire + perfiles de acero galvanizado</i>	0.361	6				
3	Gypsum plaster / <i>Guarnecido de yeso</i>	0.570	1.5				
4	Termoarcilla 19 / <i>Termoarcilla 19</i>	0.325	19				
5	Cement mortar / <i>Mortero de cemento</i>	1.000	0.5				
6	Stainless steel bracket / <i>Ménsula de acero inoxidable</i>	17.000	-				
7	Thermal insulation mineral wool / <i>Aislamiento térmico lana mineral</i>	0.040	14				
8	Air cavity / <i>Cámara de aire ventilada</i>	-	-				
9	Ceramic tile / <i>Placa cerámica</i>	-	-				
Other materials (materials not in the standard components)							
				10	Concrete column / <i>Pilar de hormigón</i>	2.300	-

Ceiling connection

Muro exterior – forjado intermedio

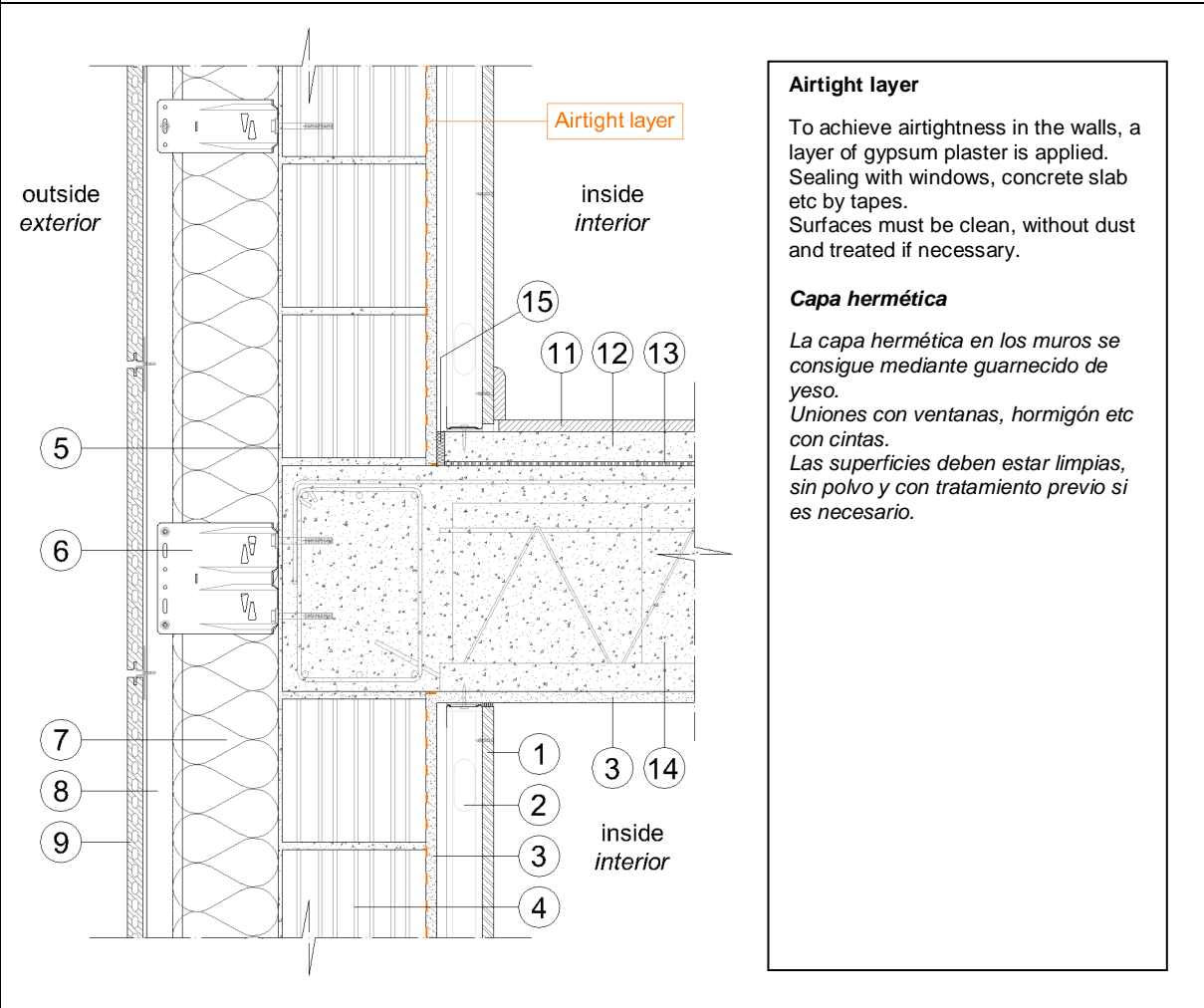
04 EW1_EW1_CE1

04 EWCE



CONSORCIO
TERMOARCILLA

Design drawing – Vertical cross-section / Detalle constructivo – Sección vertical



From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]	From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]
Standard component : Exterior wall				Standard component : Ceiling			
1	Gypsum board / Placa yeso laminado	0.250	1.5	11	Ceramic finishing / Baldosa cerámica	-	-
2	Air layer + steel studs / Cámara de aire + perfiles de acero galvanizado	0.361	6	12	Cement mortar / Mortero de cemento	-	-
3	Gypsum plaster / Guarnecido de yeso	0.570	1.5	13	Anti-impact sheet / Lámina anti-impacto	-	-
4	Termoarcilla 19 / Termoarcilla 19	0.325	19	14	Beam and clay block floor slab / Forjado de bovedilla cerámica	0.938	30
5	Cement mortar / Mortero de cemento	1.000	0.5	3	Gypsum plaster / Guarnecido de yeso	0.570	1.5
6	Stainless steel bracket / Ménsula de acero inoxidable	-	-				
7	Thermal insulation mineral wool / Aislamiento térmico lana mineral	0.040	14				
8	Air cavity / Cámara de aire ventilada	-	-				
9	Ceramic tile / Placa cerámica	-	-				
				Other materials (materials not in the standard components)			
				15	Joint / Junta	-	-

Parapet
Muro exterior – cubierta plana

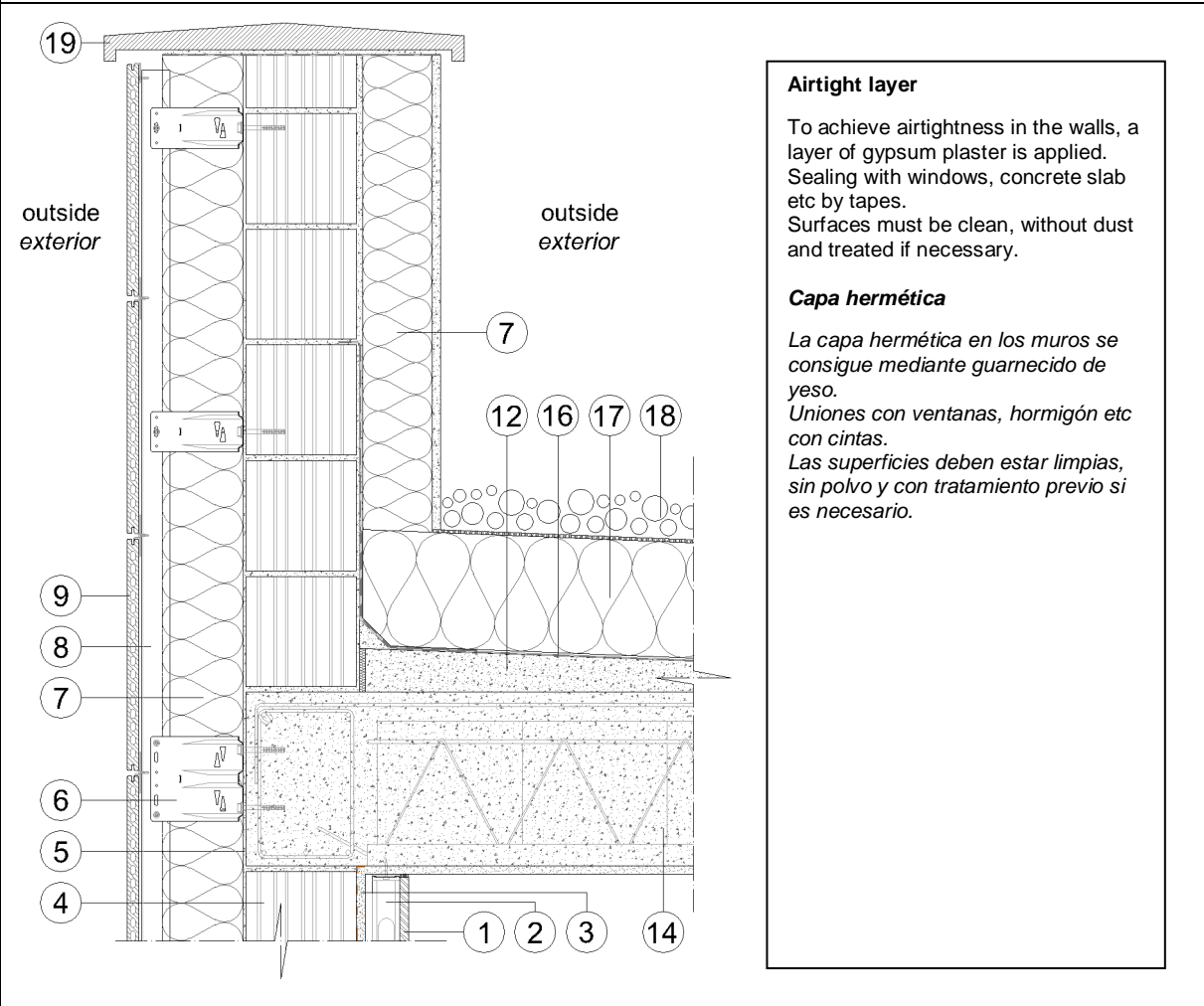
05 EW1_RO1_pp1

05 EWRO



**CONSORCIO
TERMOARCILLA**

Design drawing – Vertical cross-section / Detalle constructivo – Sección vertical



From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]	From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]
Standard component : Exterior wall				Standard component : Flat roof			
1	Gypsum board / <i>Placa yeso laminado</i>	0.250	1.5	3	Gypsum plaster / <i>Guarnecido de yeso</i>	0.570	1.5
2	Air layer + steel studs / <i>Cámara de aire + perfiles de acero galvanizado</i>	0.361	6	14	Beam and clay block floor slab / <i>Forjado de bovedilla cerámica</i>	0.938	30
3	Gypsum plaster / <i>Guarnecido de yeso</i>	0.570	1.5	12	Cement mortar / <i>Mortero de cemento</i>	-	-
4	Termoarcilla 19 / <i>Termoarcilla 19</i>	0.325	19	16	Waterproofing / <i>Impermeabilización</i>	-	-
5	Cement mortar / <i>Mortero de cemento</i>	1.000	0.5	17	Thermal insulation XPS / <i>Aislamiento térmico XPS</i>	0.037	20
6	Stainless steel bracket / <i>Ménsula de acero inoxidable</i>	-	-	18	Gravel / <i>Grava</i>	-	-
7	Thermal insulation mineral wool / <i>Aislamiento térmico lana mineral</i>	0.040	14				
8	Air cavity / <i>Cámara de aire ventilada</i>	-	-				
9	Ceramic tile / <i>Placa cerámica</i>	-	-				
				Other materials (materials not in the standard components)			
				19	Coping stone / <i>Albardilla</i>	1.000	-

Eaves

Muro exterior – cubierta inclinada

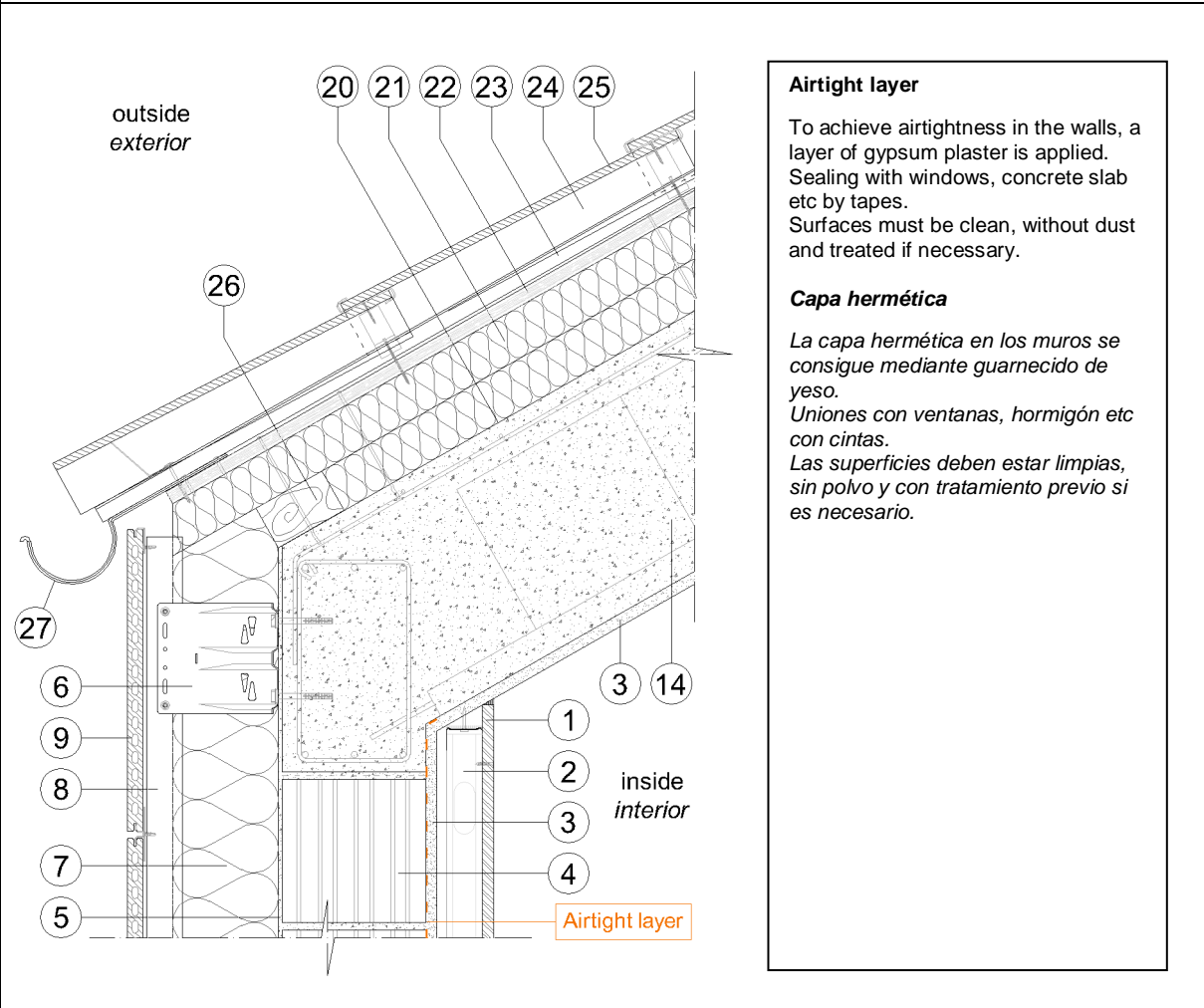
06 EW1_RO2_ea1

06 EWRO



CONSORCIO
TERMOARCILLA

Design drawing – Vertical cross-section / Detalle constructivo – Sección vertical



Airtight layer

To achieve airtightness in the walls, a layer of gypsum plaster is applied. Sealing with windows, concrete slab etc by tapes. Surfaces must be clean, without dust and treated if necessary.

Capa hermética

La capa hermética en los muros se consigue mediante guarnecido de yeso. Uniones con ventanas, hormigón etc con cintas. Las superficies deben estar limpias, sin polvo y con tratamiento previo si es necesario.

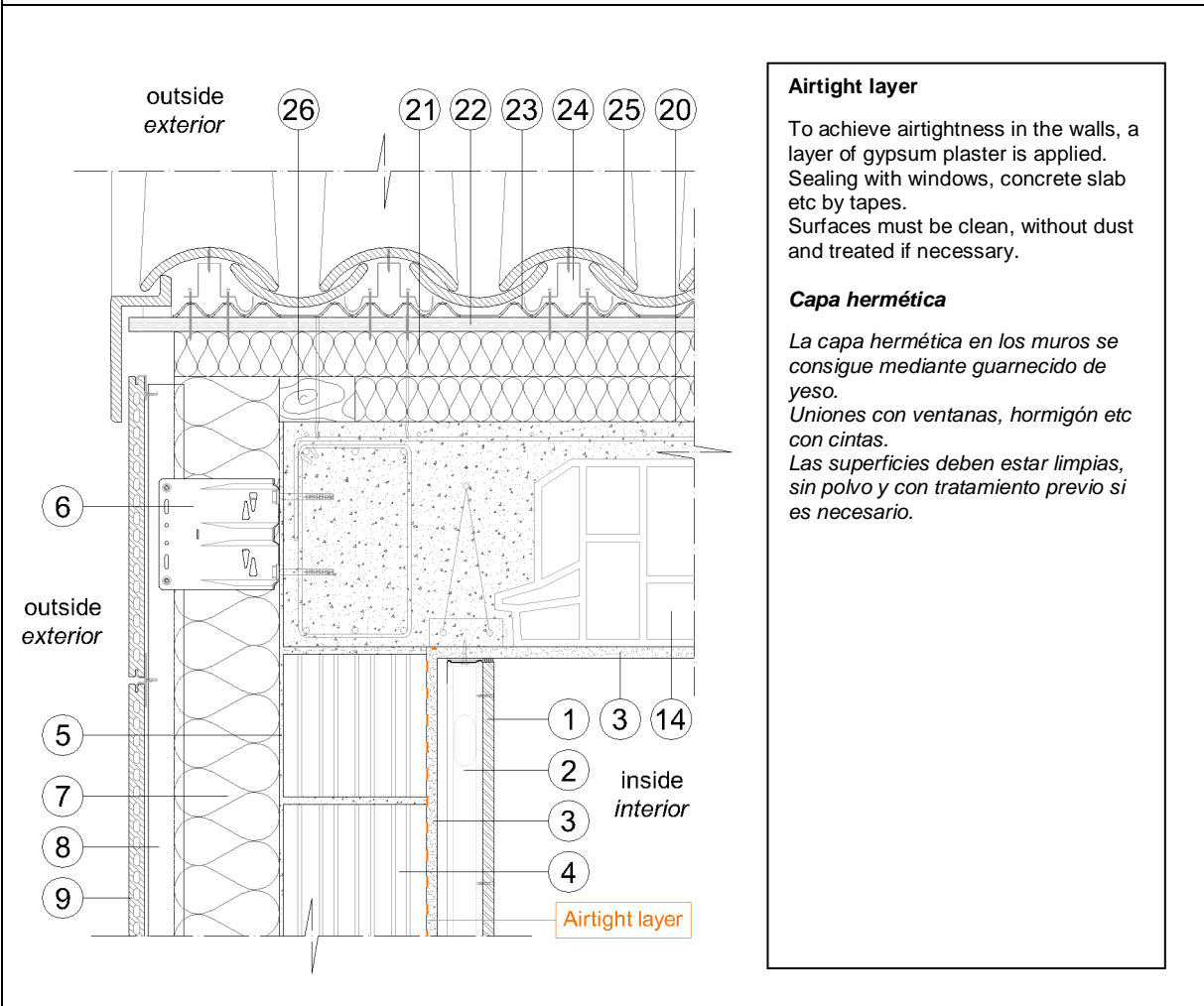
From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]	From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]
Standard component : Exterior wall				Standard component : Pitched roof			
1	Gypsum board / Placa yeso laminado	0.250	1.5	3	Gypsum plaster / Guarnecido de yeso	0.570	1.5
2	Air layer + steel studs / Cámara de aire + perfiles de acero galvanizado	0.361	6	14	Beam and clay block floor slab / Forjado de bovedilla cerámica	0.938	30
3	Gypsum plaster / Guarnecido de yeso	0.570	1.5	20	Vapor barrier / Barrera de vapor	-	-
4	Termoarcilla 19 / Termoarcilla 19	0.325	19	21	Thermal insulation PIR / Aislamiento térmico PIR	0.027	12
5	Cement mortar / Mortero de cemento	1.000	0.5	22	Wooden board / Tablero de madera	0.130	1.9
6	Stainless steel bracket / Ménsula de acero inoxidable	-	-	23	Waterproofing / Impermeabilización	-	-
7	Thermal insulation mineral wool / Aislamiento térmico lana mineral	0.040	14	24	Air layer / Cámara de aire	-	-
8	Air cavity / Cámara de aire ventilada	-	-	25	Tiles / Tejas	-	-
9	Ceramic tile / Placa cerámica	-	-	Other materials (materials not in the standard components)			
				26	Softwood / Madera	0.130	-
				27	Gutter / Canalón	-	-

Verge
Muro exterior – cubierta inclinada

07 EW1_RO2_ve1
07 ROVE



Design drawing – Vertical cross-section / Detalle constructivo – Sección vertical



Airtight layer

To achieve airtightness in the walls, a layer of gypsum plaster is applied. Sealing with windows, concrete slab etc by tapes. Surfaces must be clean, without dust and treated if necessary.

Capa hermética

La capa hermética en los muros se consigue mediante guarnecido de yeso. Uniones con ventanas, hormigón etc con cintas. Las superficies deben estar limpias, sin polvo y con tratamiento previo si es necesario.

From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]	From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]
Standard component : Exterior wall				Standard component : Pitched roof			
1	Gypsum board / Placa yeso laminado	0.250	1.5	3	Gypsum plaster / Guarnecido de yeso	0.570	1.5
2	Air layer + steel studs / Cámara de aire + perfiles de acero galvanizado	0.361	6	14	Beam and clay block floor slab / Forjado de bovedilla cerámica	0.938	30
3	Gypsum plaster / Guarnecido de yeso	0.570	1.5	20	Vapor barrier / Barrera de vapor	-	-
4	Termoarcilla 19 / Termoarcilla 19	0.325	19	21	Thermal insulation PIR / Aislamiento térmico PIR	0.027	12
5	Cement mortar / Mortero de cemento	1.000	0.5	22	Wooden board / Tablero de madera	0.130	1.9
6	Stainless steel bracket / Ménsula de acero inoxidable	-	-	23	Waterproofing / Impermeabilización	-	-
7	Thermal insulation mineral wool / Aislamiento térmico lana mineral	0.040	14	24	Air layer / Cámara de aire	-	-
8	Air cavity / Cámara de aire ventilada	-	-	25	Tiles / Tejas	-	-
9	Ceramic tile / Placa cerámica	-	-	Other materials (materials not in the standard components)			
				26	Softwood / Madera	0.130	-

Window bottom connection
Instalación inferior ventana

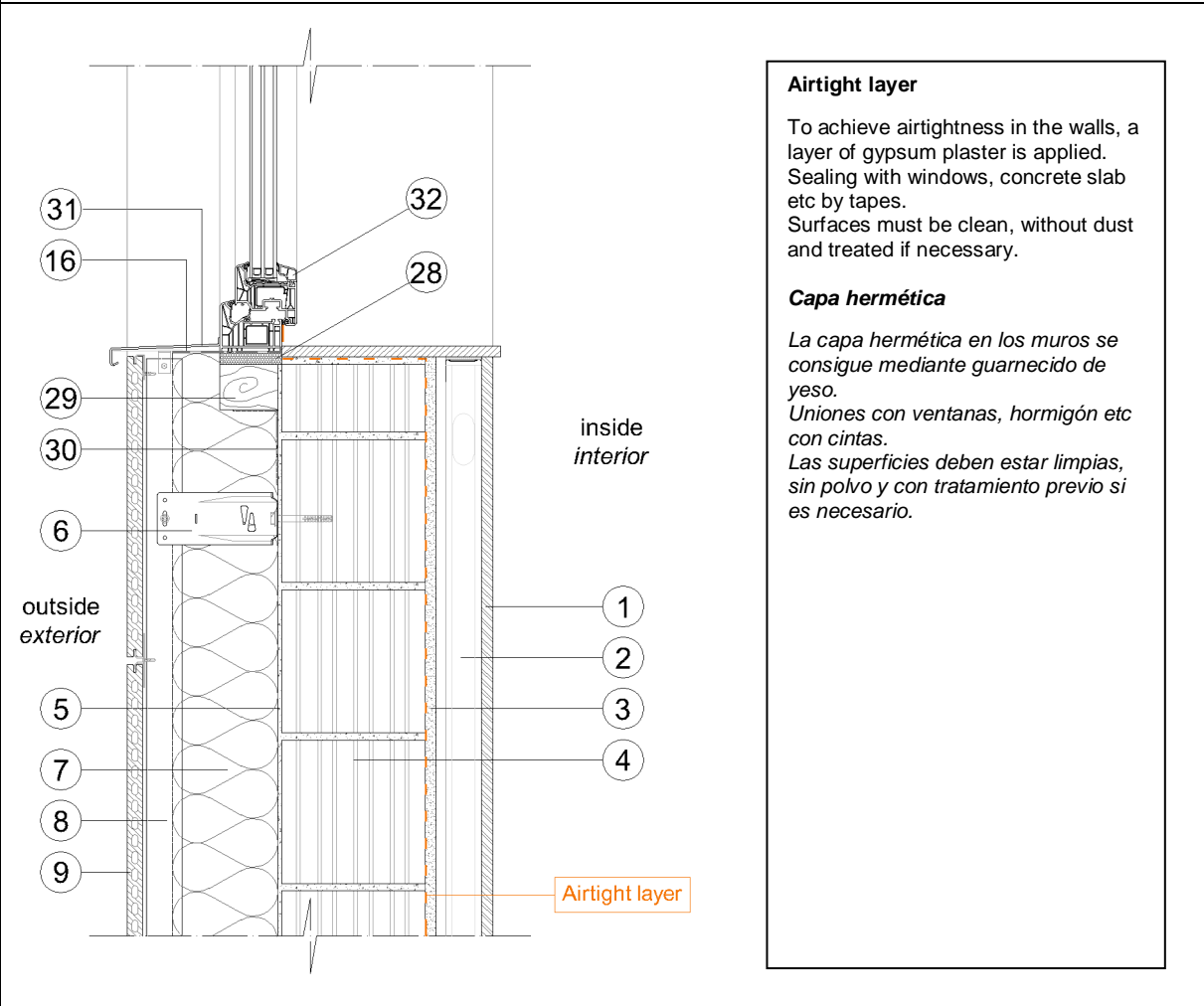
08 EW1_OB1_1

08 WIBO



**CONSORCIO
TERMOARCILLA**

Design drawing – Vertical cross-section / Detalle constructivo – Sección vertical



Airtight layer

To achieve airtightness in the walls, a layer of gypsum plaster is applied. Sealing with windows, concrete slab etc by tapes. Surfaces must be clean, without dust and treated if necessary.

Capa hermética

La capa hermética en los muros se consigue mediante guarnecido de yeso. Uniones con ventanas, hormigón etc con cintas. Las superficies deben estar limpias, sin polvo y con tratamiento previo si es necesario.

From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]	From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]
Standard component : Exterior wall							
1	Gypsum board / <i>Placa yeso laminado</i>	0.250	1.5				
2	Air layer + steel studs / <i>Cámara de aire + perfiles de acero galvanizado</i>	0.361	6				
3	Gypsum plaster / <i>Guarnecido de yeso</i>	0.570	1.5				
4	Termoarcilla 19 / <i>Termoarcilla 19</i>	0.325	19				
5	Cement mortar / <i>Mortero de cemento</i>	1.000	0.5				
6	Stainless steel bracket / <i>Ménsula de acero inoxidable</i>	-	-				
7	Thermal insulation mineral wool / <i>Aislamiento térmico lana mineral</i>	0.040	14				
8	Air cavity / <i>Cámara de aire ventilada</i>	-	-				
9	Ceramic tile / <i>Placa cerámica</i>	-	-				
Other materials (materials not in the standard components)							
	16	Waterproofing / <i>Impermeabilización</i>			0.250		-
	28	PU in-situ foam / <i>Espuma de poliuretano</i>			0.040		1.5
	29	Wooden subframe / <i>Prearco de madera</i>			0.130		-
	30	Steel piece / <i>Pieza acero galvanizado</i>			160.000		-
	31	Window sill / <i>Vierteaguas</i>			-		-
	32	PVC piece / <i>Pieza PVC</i>			0.113		-

Window top connection
Instalación superior ventana

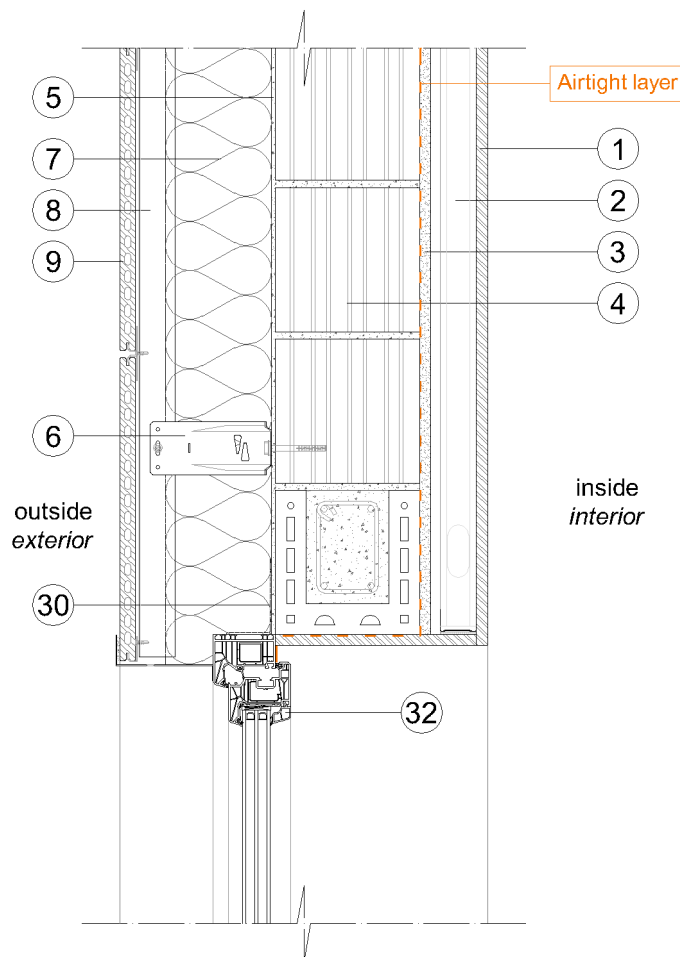
09 EW1_OH1_2a

09 WITO



**CONSORCIO
TERMOARCILLA**

Design drawing – Vertical cross-section / Detalle constructivo – Sección vertical



Airtight layer

To achieve airtightness in the walls, a layer of gypsum plaster is applied. Sealing with windows, concrete slab etc by tapes. Surfaces must be clean, without dust and treated if necessary.

Capa hermética

La capa hermética en los muros se consigue mediante guarnecido de yeso. Uniones con ventanas, hormigón etc con cintas. Las superficies deben estar limpias, sin polvo y con tratamiento previo si es necesario.

From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]	From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]
Standard component : Exterior wall							
1	Gypsum board / <i>Placa yeso laminado</i>	0.250	1.5				
2	Air layer + steel studs / <i>Cámara de aire + perfiles de acero galvanizado</i>	0.361	6				
3	Gypsum plaster / <i>Guarnecido de yeso</i>	0.570	1.5				
4	Termoarcilla 19 / <i>Termoarcilla 19</i>	0.325	19				
5	Cement mortar / <i>Mortero de cemento</i>	1.000	0.5				
6	Stainless steel bracket / <i>Ménsula de acero inoxidable</i>	-	-				
7	Thermal insulation mineral wool / <i>Aislamiento térmico lana mineral</i>	0.040	14				
8	Air cavity / <i>Cámara de aire ventilada</i>	-	-				
9	Ceramic tile / <i>Placa cerámica</i>	-	-				
Other materials (materials not in the standard components)							
				30	Steel piece / <i>Pieza acero galvanizado</i>	-	-
				32	PVC piece / <i>Pieza PVC</i>	0.113	-

Window side connection
Instalación lateral ventana

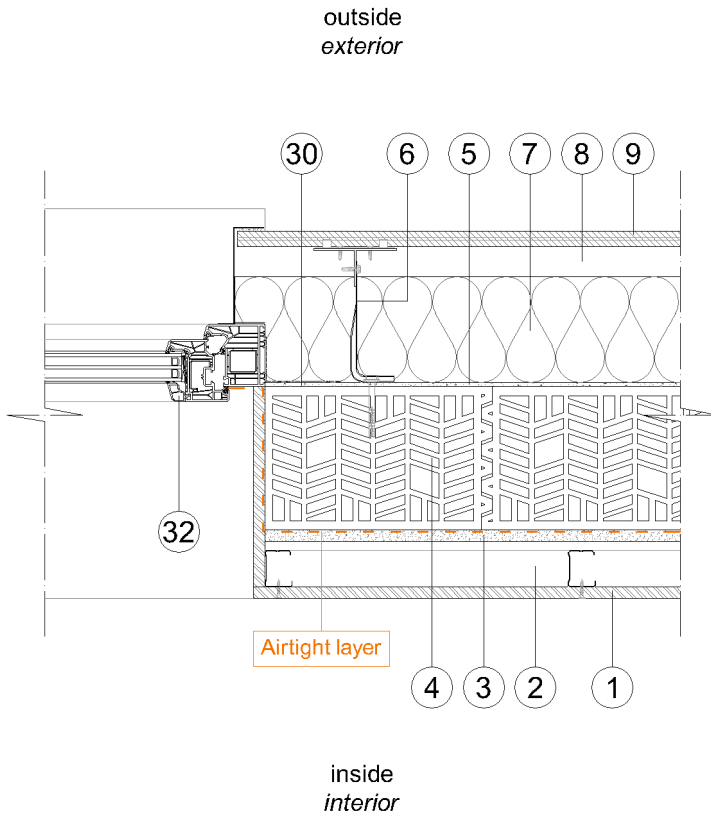
10 EW1_OJ1_1a

10 WISI



**CONSORCIO
TERMOARCILLA**

Design drawing – Horizontal cross-section / Detalle constructivo – Sección horizontal



Airtight layer

To achieve airtightness in the walls, a layer of gypsum plaster is applied. Sealing with windows, concrete slab etc by tapes. Surfaces must be clean, without dust and treated if necessary.

Capa hermética

La capa hermética en los muros se consigue mediante guarnecido de yeso. Uniones con ventanas, hormigón etc con cintas. Las superficies deben estar limpias, sin polvo y con tratamiento previo si es necesario.

From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]	From the inside towards the outside		λ [W/(mK)]	Thick ness [cm]
Standard component : Exterior wall							
1	Gypsum board / <i>Placa yeso laminado</i>	0.250	1.5				
2	Air layer + steel studs / <i>Cámara de aire + perfiles de acero galvanizado</i>	0.361	6				
3	Gypsum plaster / <i>Guarnecido de yeso</i>	0.570	1.5				
4	Termoarcilla 19 / <i>Termoarcilla 19</i>	0.325	19				
5	Cement mortar / <i>Mortero de cemento</i>	1.000	0.5				
6	Stainless steel bracket / <i>Ménsula de acero inoxidable</i>	-	-				
7	Thermal insulation mineral wool / <i>Aislamiento térmico lana mineral</i>	0.040	14				
8	Air cavity / <i>Cámara de aire ventilada</i>	-	-				
9	Ceramic tile / <i>Placa cerámica</i>	-	-				
Other materials (materials not in the standard components)							
				30	Steel piece / <i>Pieza acero galvanizado</i>	-	-
				32	PVC piece / <i>Pieza PVC</i>	0.113	-

Floor slab edge

Muro exterior – forjado sanitario

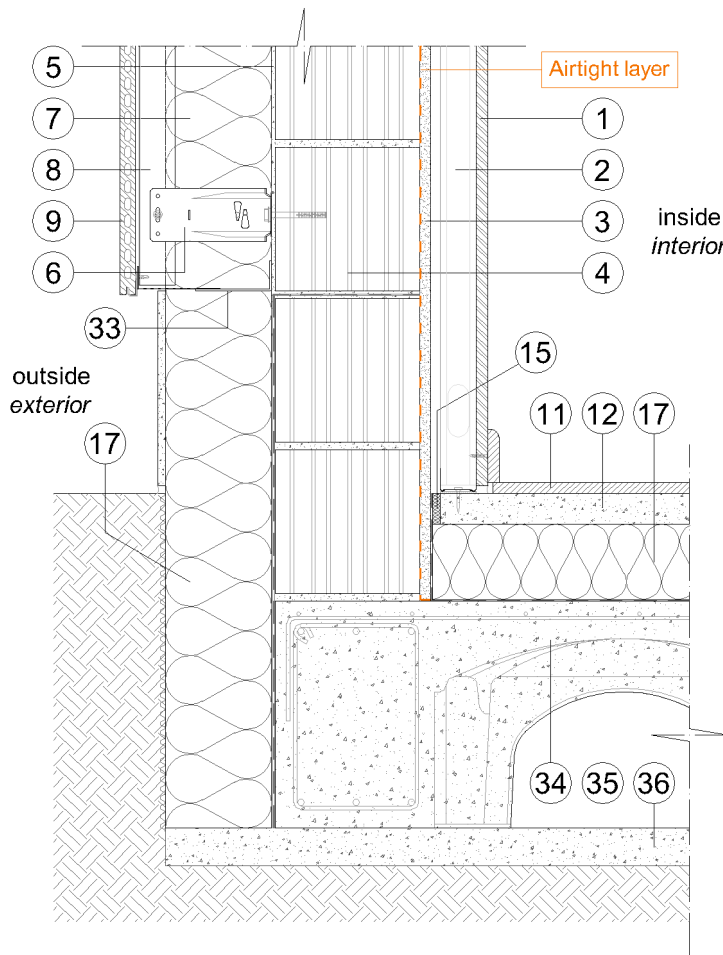
11 FS1_EW1

11 FSEW



**CONSORCIO
TERMOARCILLA**

Design drawing – Vertical cross-section / Detalle constructivo – Sección vertical



Airtight layer

To achieve airtightness in the walls, a layer of gypsum plaster is applied. Sealing with windows, concrete slab etc by tapes. Surfaces must be clean, without dust and treated if necessary.

Capa hermética

La capa hermética en los muros se consigue mediante guarnecido de yeso. Uniones con ventanas, hormigón etc con cintas. Las superficies deben estar limpias, sin polvo y con tratamiento previo si es necesario.

From the inside towards the outside				λ [W/(mK)]	Thick ness [cm]	From the inside towards the outside				λ [W/(mK)]	Thick ness [cm]
Standard component : Exterior wall						Standard component : Floor slab					
1	Gypsum board / <i>Placa yeso laminado</i>	0.250	1.5	11	Ceramic finishing / <i>Baldosa cerámica</i>	-	-				
2	Air layer + steel studs / <i>Cámara de aire + perfiles de acero galvanizado</i>	0.361	6	12	Cement screed / <i>Mortero de cemento</i>	1.400	4				
3	Gypsum plaster / <i>Guarnecido de yeso</i>	0.570	1.5	17	Thermal insulation XPS / <i>Aislamiento térmico XPS</i>	0.037	10				
4	Termoarcilla 19 / <i>Termoarcilla 19</i>	0.325	19	34	Concrete slab / <i>Forjado de hormigón</i>	2.300	10				
5	Cement mortar / <i>Mortero de cemento</i>	1.000	0.5	35	Ventilated crawl space / <i>Cámara ventilada</i>	2.300	20				
6	Stainless steel bracket / <i>Ménsula de acero inoxidable</i>	-	-	36	Concrete / <i>Hormigón de limpieza</i>	-	-				
7	Thermal insulation mineral wool / <i>Aislamiento térmico lana mineral</i>	0.040	14								
8	Air cavity / <i>Cámara de aire ventilada</i>	-	-								
9	Ceramic tile / <i>Placa cerámica</i>	-	-								
						Other materials (materials not in the standard components)					
				15	Joint / <i>Junta</i>	-	-				
				33	PVC-U piece / <i>Perfil PVC-U</i>	0.170	-				

Window bottom – floor slab
Umbral terreno balconera

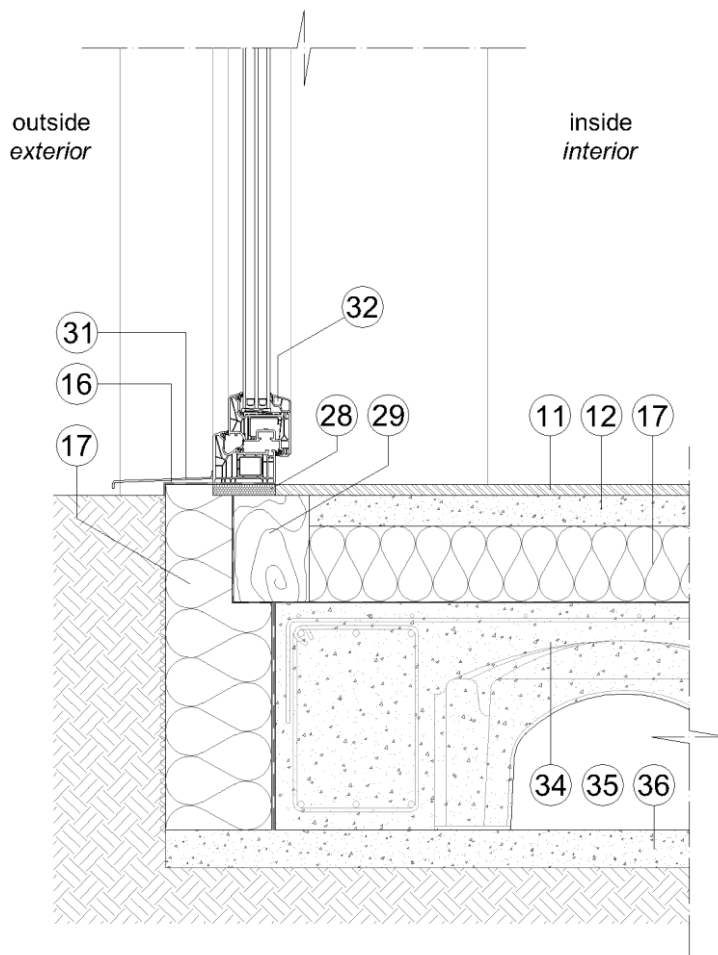
12 FS1_OT1_1

12 WITH



**CONSORCIO
TERMOARCILLA**

Design drawing – Vertical cross-section / Detalle constructivo – Sección vertical



Airtight layer

To achieve airtightness in the walls, a layer of gypsum plaster is applied. Sealing with windows, concrete slab etc by tapes. Surfaces must be clean, without dust and treated if necessary.

Capa hermética

La capa hermética en los muros se consigue mediante guarnecido de yeso. Uniones con ventanas, hormigón etc con cintas. Las superficies deben estar limpias, sin polvo y con tratamiento previo si es necesario.

From the inside towards the outside				λ [W/(mK)]	Thick ness [cm]	From the inside towards the outside				λ [W/(mK)]	Thick ness [cm]
Standard component : Exterior wall						Standard component : Floor slab					
1	Gypsum board / <i>Placa yeso laminado</i>	0.250	1.5	11	Ceramic finishing / <i>Baldosa cerámica</i>	-	-				
2	Air layer + steel studs / <i>Cámara de aire + perfiles de acero galvanizado</i>	0.361	6	12	Cement screed / <i>Mortero de cemento</i>	1.400	4				
3	Gypsum plaster / <i>Guarnecido de yeso</i>	0.570	1.5	17	Thermal insulation XPS / <i>Aislamiento térmico XPS</i>	0.037	10				
4	Termoarcilla 19 / <i>Termoarcilla 19</i>	0.325	19	34	Concrete slab / <i>Forjado de hormigón</i>	2.300	10				
5	Cement mortar / <i>Mortero de cemento</i>	1.000	0.5	35	Ventilated crawl space / <i>Cámara ventilada</i>	2.300	20				
6	Stainless steel bracket / <i>Ménsula de acero inoxidable</i>	-	-	36	Concrete / <i>Hormigón de limpieza</i>	-	-				
7	Thermal insulation mineral wool / <i>Aislamiento térmico lana mineral</i>	0.040	14								
8	Air cavity / <i>Cámara de aire ventilada</i>	-	-								
9	Ceramic tile / <i>Placa cerámica</i>	-	-								
Other materials (materials not in the standard components)											
				14	Waterproofing / <i>Impermeabilización</i>	0.250	-				
				28	PU in-situ foam / <i>Espuma de poliuretano</i>	0.040	1.5				
				29	Wooden subframe / <i>Prearco de madera</i>	0.130	-				
				31	Door sill / <i>Vierteaguas</i>	160.000	-				
				32	PVC piece / <i>Pieza PVC</i>	0.113	-				