Certification report | Zertifizierungsbericht

Passive House Institute

Wall system
Wandsystem

for cool, temperated climate

für kühl-gemäßigte Klimate

Product I Produkt: **Passiefbouwblok**

Client I Auftraggeber: **ICF Moulding B.V.**

Construction | Konstruktion: **Insulated Formwork blocks | Betonschalungsstein**

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Date I Datum: **27.12.2021**

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1 Introduction | *Einleitung*

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 proved, the label "Certified Passive House Component" can be awarded by the Passive House Institute (PHI)

Passivhäuser stellen aufgrund der Möglichkeit, auf ein separates Heizsystem zu verzichten, hohe Anforderungen an die Qualität der verwendeten Bauteile. Dabei steigen die Anforderungen, je kälter das Klima ist. Darum hat das Passivhaus Institut Regionen gleicher Anforderung identifiziert und für diese Zertifizierungskriterien festgelegt. Die Kriterien sind auf der Homepage des Passivhaus Instituts als kostenfreier Download verfügbar.

Werden die unten zusammengefassten Anforderungen erreicht und ist eine gut geplante luftdichte Ebene nachgewiesen, kann ein Produkt als "Zertifizierte Passivhaus Komponente“ ausgezeichnet werden.

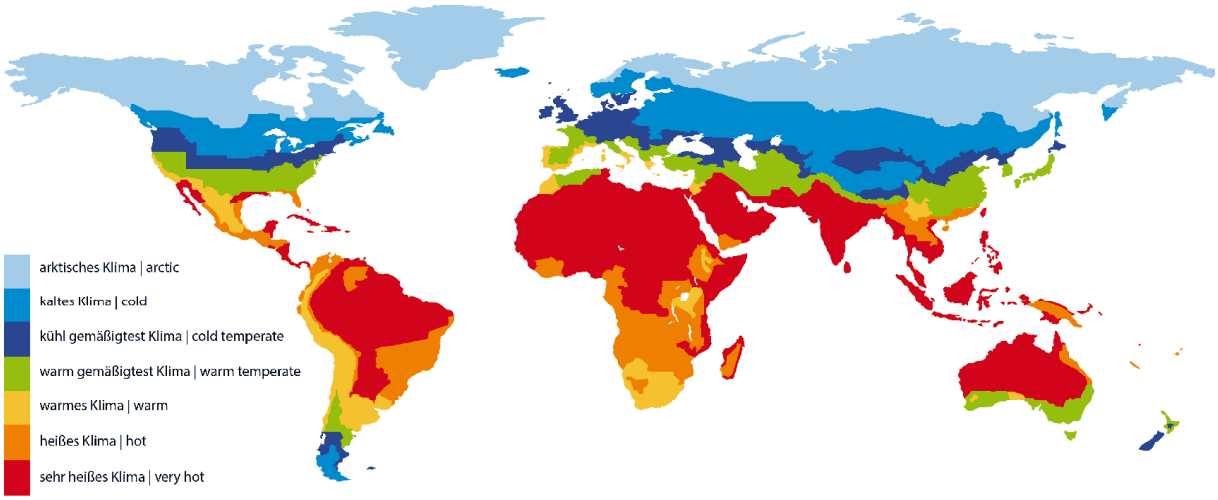
Table 1: Adequate certification criteria

Climate zone	**Hygiene criterion**	**Comfort criterion**	**Efficiency criteria**		
	$f_{Rsi=0.25\ m^2K/W} \geq$[3]	U-value of the installed window[1] ≤	U-value opaque to ambient $U_{opaque} * f_{PHI}^2 \leq$	Purely opaque details $f_{Rsi=0.25\ m^2K/W} \geq$	Absence of thermal bridges $\Psi_a \leq$[4]
	[-]	[W/(m²K)]	[W/(m²K)]	[-]	[W/(mK)]
1 Arctic	0.80	0.45 (0.35)	0.09	0.90	0.01
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	

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

2 $f_{R,\ PHI}$: Reduction factor: always 1, exception: areas in contact with the ground and towards the unheated basement: 0.6

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



2 Description of the certified system | *Systembeschreibung*

2.1 Opaque building envelop | *Opake Gebäudehülle*

The certified Passief Bouwblok is an Insulated Concrete Forms (ICF) facade system. The blocks are 400 mm wide and consist of two layers of Neopor, 0,031 W/(mK), which are firmly connected with plastic spacers. The 140mm gap is filled with concrete. The facade is finished with plaster. Stone strips and also facade cladding is also possible. The system can be combined with various types of (prefab) foundation and roof systems. The Passive House element certification is carried out with the Hectar floor system and self-supporting roof plates.

Der zertifizierte Passief Bouwblok ist ein Wandbausystem aus Beton Schalungssteinen. Die Blöcke sind 400 mm breit und bestehen aus zwei Schichten Neopor, die fest mit Kunststoffabstandshaltern verbunden sind. Der 140mm Spalt ist mit Beton gefüllt. Die Fassade ist verputzt, kann aber auch mit Riemchen oder einer hinterlüfteten Fassade verkleidet werden. Das System kann gut mit verschiedenen Arten von (vorgefertigten) Fundament- und Dachsystemen kombiniert werden. Die Passivhaus-Elementzertifizierung erfolgt mit dem Hectar-Bodensystem und selbsttragenden Dachplatten.

2.2 Windows | *Fenster*

The windows, Enersign Primus, are made of spruce/fir frame (0.11 W/(mK)), insulated on the outside with thermoplastic foam and finished with aluminium. A 48 mm glazing and SWISSPACER Ultimate where taken into account. The window represents a very good energy-standard in itself. Connection details with a strong and rigid EPS-foam, Compacfoam, leads to low thermal bridges and high inner surface temperatures.

Die Fenster, Enersign Primus, bestehen aus Fichtenholzrahmen (0,11 W / (mK)), die außen mit thermoplastischem Schaum gedämmt und mit Aluminium versehen sind. Die Berechnungen wurden mit einer Verglasung von 48 mm und einem SWISSPACER Ultimate durchgeführt. Das Fenster an sich repräsentiert einen sehr guten Energie- und Qualitätsstandard. Verbindungsdetails mit einem starken und harten EPS-Schaum, Compacfoam, führen zu niedrigen Wärmebrücken und hohen inneren Oberflächentemperaturen.

2.3 Airtightness concept | *Luftdichtheitskonzept*

The in situ concrete floor construction, the interior plaster and the OSB boards in the roof are the airtight layer. The airtight connections between floor-outside walls, outside wall-roof and outside wall-windows are provided by properly applied Cantex, a multifunctional liquid rubber.

Die vor Ort gegossene Betonbodenplatte, der Innenputz der Wände und die Holzplatten an der Innenseite der Dachelemente bilden die luftdichte Hülle. Die luftdichten Verbindungen zwischen Bodenplatte-Außenfassaden, Außenfassaden-Dachelementen und Außenfassaden-Fenstern werden mit sorgfältig und korrekt ausgeführtem Cantex, einem multifunktionalen Flüssiggummi hergestellt.

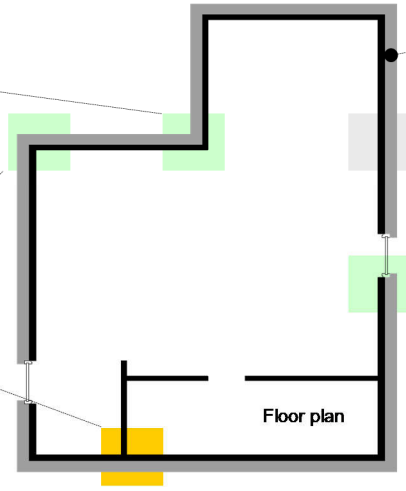
3 Evaluation | *Bewertung*

The examined building system with the indicated details meets the PHI criteria for Certified Passive House Components.

Das untersuchte Bausystem entspricht den Anforderungen an eine Zertifizierte Passivhaus Komponente.

4 Summary of the results | *Zusammenfassung der Ergebnisse*

Thermal bridge not calculated
Criteria achieved
Efficieny driteria not achieved
Hygiene- or comfortcriterion not achieved



EW1	External wall
U [W/(m²K)]	0,11
Thickness [m]	0,363

EW1_EW1_ic1	
Ext.w.-inner corner	
Ψ [W//mK]	0,028
$f_{Rsi=0,25\ m²K/W}$	0,97

EW1_EW1_ec1	
Ext.w.-outer corner	
Ψ [W//mK]	-0,053
$f_{Rsi=0,25\ m²K/W}$	0,95

EW1_IW1	
Ext.w.-internal wall	
Ψ [W//mK]	0,023
$f_{Rsi=0,25\ m²K/W}$	0,93

EW1_EW1	
Ext.w.eksm. junction	
Ψ [W/(mK)]	
$f_{Rsi=0,25\ m²K/W}$	

EW1_OJ	Window side		
Typ	1	2	3
b_f [m]	0,1		
U_f [W/m²K]	0,63		
Ψ_g [W/mK]	0,019		
Ψ_i [W/mK]	-0,001		
$f_{Rsi=0,25\ m²K/W}$	0,75		

EW1_RO1_ve1	
Verge	
Ψ [W//mK]	-0,058
$f_{Rsi=0,25\ m²K/W}$	0,92

RO1_IW1	
Roof - internal wall	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

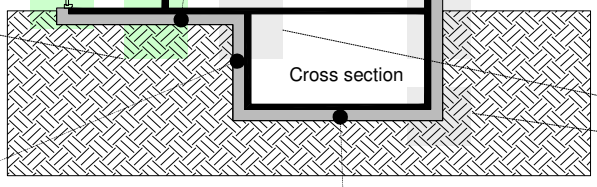
RO1_RWJ1	
Roof window top	
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

EW1_EW1_CE1	
Ext.w.-ceiling	
Ψ [W//mK]	0,038
$f_{Rsi=0,25\ m²K/W}$	18,05

FS1_OT1	
Window threshold	
b_f [m]	0,100
U_f [W/m²K]	1,07
Ψ_e [W/mK]	0,021
Ψ_i [W/mK]	0,142
$f_{Rsi=0,25\ m²K/W}$	0,70
$U_{w,i}$ [W//m²K]	0,78

RO1	Roof
U [W/(m²K)]	0,08
Thickness [m]	0,500

FS1	Floor slab
U [W/(m²K)]	0,07
Thickness [m]	0,648



EW1_OH	Window top		
Typ	1	2	3
b_f [m]	0,1		
U_f [W/m²K]	0,63		
Ψ_g [W/mK]	0,019		
Ψ_i [W/mK]	-0,003		
$f_{Rsi=0,25\ m²K/W}$	0,75		

EW1_OB	Window bottom		
b_f [m]	0,1		
U_f [W/m²K]	0,63		
Ψ_g [W/mK]	0,019		
Ψ_i [W/mK]	0,032		
$f_{Rsi=0,25\ m²K/W}$	0,75		
$U_{w,i}$ [W//m²K]	0,75		

BW1_BC1	Basem.w.-basem.c.
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

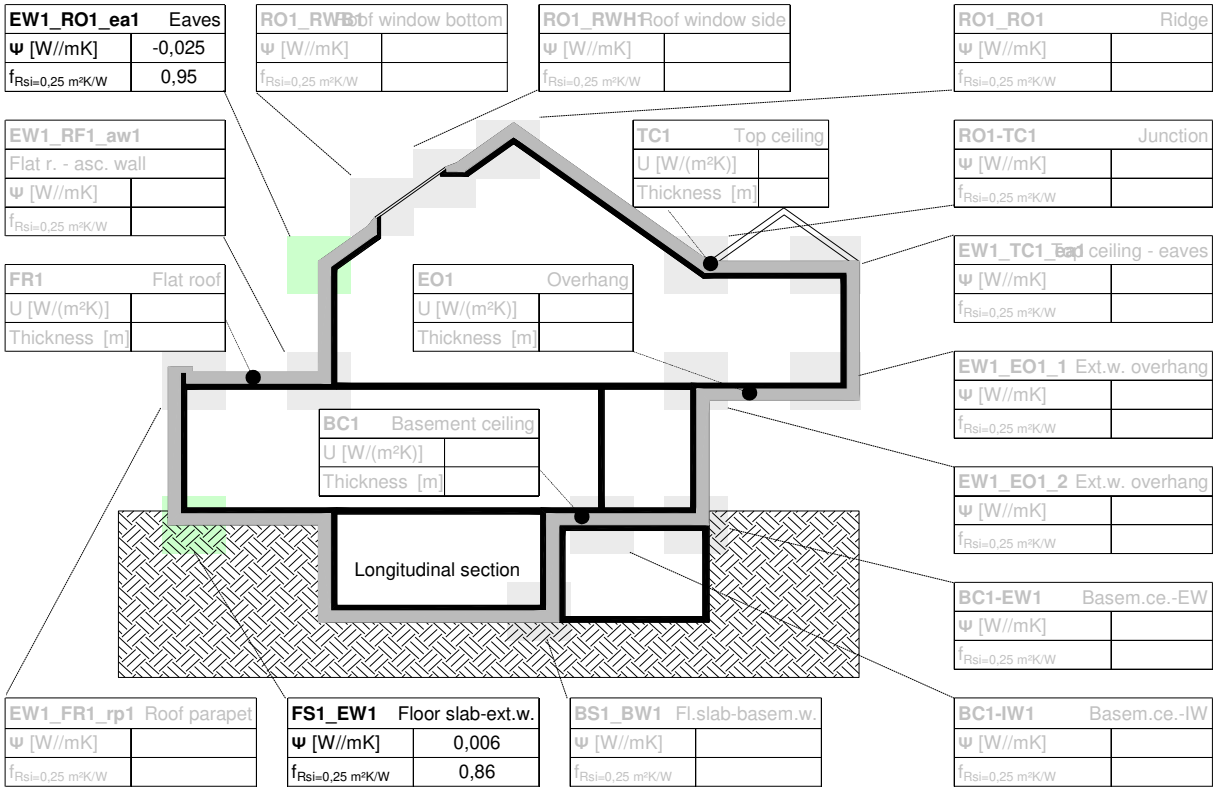
FS1_IW1	
Fl.slab-intern.w	
Ψ [W//mK]	0,000
$f_{Rsi=0,25\ m²K/W}$	0,97

BW1_FS1	Basem.w.-floor slab
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	

BW1	Basement wall
U [W/(m²K)]	
Thickness [m]	

BS1_BW1	Basement slab	U [W/(m²K)]		Thickness [m]	

BS1_BW1	Fl.slab-basem.w.
Ψ [W//mK]	
$f_{Rsi=0,25\ m²K/W}$	


EW1_RO1_ea1 Eaves
Ψ [W//mK] -0,025
fRsi=0,25 m²K/W 0,95
RO1_RWB1 Roof window bottom
Ψ [W//mK]
fRsi=0,25 m²K/W
RO1_RWH1 Roof window side
Ψ [W//mK]
fRsi=0,25 m²K/W
RO1_RO1 Ridge
Ψ [W//mK]
fRsi=0,25 m²K/W
EW1_RF1_aw1
Flat r. - asc. wall
Ψ [W//mK]
fRsi=0,25 m²K/W
TC1 Top ceiling
U [W/(m²K)]
Thickness [m]
RO1-TC1 Junction
Ψ [W//mK]
fRsi=0,25 m²K/W
EW1_TC1_ea1 Top ceiling - eaves
Ψ [W//mK]
fRsi=0,25 m²K/W
FR1 Flat roof
U [W/(m²K)]
Thickness [m]
EO1 Overhang
U [W/(m²K)]
Thickness [m]
EW1_EO1_1 Ext.w. overhang
Ψ [W//mK]
fRsi=0,25 m²K/W
BC1 Basement ceiling
U [W/(m²K)]
Thickness [m]
EW1_EO1_2 Ext.w. overhang
Ψ [W//mK]
fRsi=0,25 m²K/W
Longitudinal section
BC1-EW1 Basem.ce.-EW
Ψ [W//mK]
fRsi=0,25 m²K/W
EW1_FR1_rp1 Roof parapet
Ψ [W//mK]
fRsi=0,25 m²K/W
FS1_EW1 Floor slab-ext.w.
Ψ [W//mK] 0,006
fRsi=0,25 m²K/W 0,86
BS1_BW1 Fl.slab-basem.w.
Ψ [W//mK]
fRsi=0,25 m²K/W
BC1-IW1 Basem.ce.-IW
Ψ [W//mK]
fRsi=0,25 m²K/W

5 Using the results in the PHPP | *Verwendung der Ergebnisse im 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.

Die folgenden Punkte sind für die Arbeit mit den hier zusammengefassten Ergebnissen im Passivhaus Projektierungs-Paket (PHPP) zu beachten:

- *Die im regulären Aufbau der Bauteile vorkommenden Wärmebrücken sind über äquivalente Wärmeleitfähigkeiten der betreffenden Bauteilschichten bereits in den U-Werten der Konstruktionen erfasst und müssen nicht weiter berücksichtigt werden.*
- *Alle linearen Wärmebrücken gelten für den Außenmaßbezug.*
- *Zusätzliche punktförmige Wärmebrücken sind zu berücksichtigen.*

6 Legal information | Rechtliche Hinweise

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 to adapted for the specific constructions. Sealing of the construction against moisture and the absence of condensation as well as the check of hydrothermal 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 based on the information provided in this report is excluded

Die folgenden Informationen sind bei der Planung und Ausführung der in diesem Bericht gezeigten Details zu beachten:

Die Detailzeichnungen in diesem Bericht sind schematisch und beispielhaft. Sie müssen evtl. auf die Spezifika auszuführender Gebäude angepasst werden. Hygrothermische Aspekte wurden im Rahmen dieser Zertifizierung nicht betrachtet. Wo nötig sollten diese Betrachtungen entsprechend den gültigen Regeln der Technik vorgenommen werden. Die Verantwortung der Umsetzung oben genannter Punkte obliegt dem Hersteller oder Anwender des Bausystems.

Die vorliegende Dokumentation erlaubt keine Rückschlüsse auf andere als die überprüften Punkte. Sie stellt insbesondere keinen Ersatz für eine bauaufsichtliche Zulassung dar.

Aus der Zertifizierung oder diesem Bericht und den darin veröffentlichten Informationen können keine Ansprüche gegen das Passivhaus abgeleitet werden.

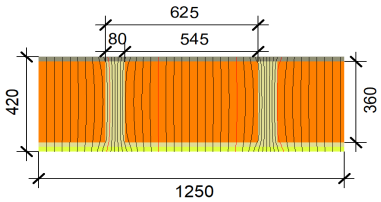
Appendix 1: U-value of building assemblies

ICF Moulding B.V.: Passiefbouwblok ID: 1810wa03 for cool, temperated climate

Acronym	Building assembly description	Interior insulation?
RO1	**Roof**	

Heat transmission resistance [m²K/W]

Orientation of building element: 1-Roof | Adjacent to: **3-Ventilated** | interior R_{si}: 0,10 | exterior R_{se}: 0,10



U-value determined by thermal simulation (see appendix 2)

length of model [m]	Δϑ [K]	thermal flux [W/m]	**U-value** [W/(m²K)]
1,250	30	**4,8510**	**0,129**

U-value determined according to PHPP

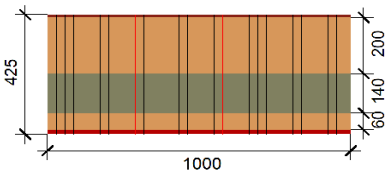
Material of Layer	λ [W/(mK)]	Description	Thickness [mm]
Woodfibre board 400 kg/m³	**0,100**	**According to ISO 10456**	**20,0**
EQ-insulation roof	**0,051**	**Insulation 0.04 W/(mK) 545 mm / Timber 0.13 W/(mK) 80 mm, e= 625 mm**	**360,0**
Soft wood / OSB	**0,130**	**According to ISO 10456**	**20,0**
Gypsum board	**0,250**	**According to ISO 10456**	**20,0**
		Total	**42,0** cm

U-value supplement: W/(m²K) | **U-value:** **0,129** W/(m²K)

Acronym	Building assembly description	Interior insulation?
EW1	**External wall**	

Heat transmission resistance [m²K/W]

Orientation of building element: 2-Wall | Adjacent to: **1-Outdoor air** | interior R_{si}: 0,13 | exterior R_{se}: 0,04



U-value determined by thermal simulation (see appendix 2)

length of model [m]	ΔΘ [K]	thermal flux [W/m]
1,000	30	**3,4648**

U-value [W/(m²K)]: **0,115**

U-value determined according to PHPP

Material of Layer	λ [W/(mK)]	Description	Thickness [mm]
Interior plaster	**0,570**	**According to EN 10456**	**15,0**
Joma EPS	**0,031**	**According to technical approval incl. Safety marging according to DIN 4106-4**	**60**
Concrete 1% steel	**2,300**	**According to EN 10456**	**140**
Joma EPS	**0,031**	**According to technical approval incl. Safety marging according to DIN 4106-4**	**200**
Organic compound plaster	**0,700**	**According to DIN 4108-4**	**10**
		Total	**42,5** cm

U-value supplement: | W/(m²K)

U-value: **0,115** W/(m²K)

Acronym	Building assembly description	Interior insulation?
FS1	**Floor slab**	

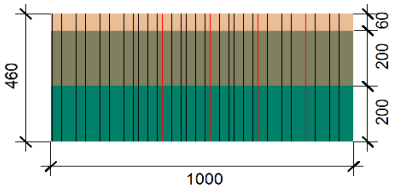
Heat transmission resistance [m²K/W]

Orientation of building element: 3-Ground | Adjacent to: 2-Ground | interior R_{si}: 0,17 | exterior R_{se}: 0,00

U-value determined by thermal simulation (see appendix 2)

length of model [m]	Δϑ [K]	thermal flux [W/m]
1,000	30	**6,3234**

U-value [W/(m²K)]: **0,211**



U-value determined according to PHPP

Material of Layer	λ [W/(mK)]	Description	Thickness [mm]
Cement screed	**1,400**	**According to DIN 4108-4**	**60**
Concrete, 1% Steel	**2,300**	**According to ISO 10456**	**200**
Unidek EPS150	**0,045**	**According to manufacturer incl. safty margin**	**200**
		Total	**46,0** cm

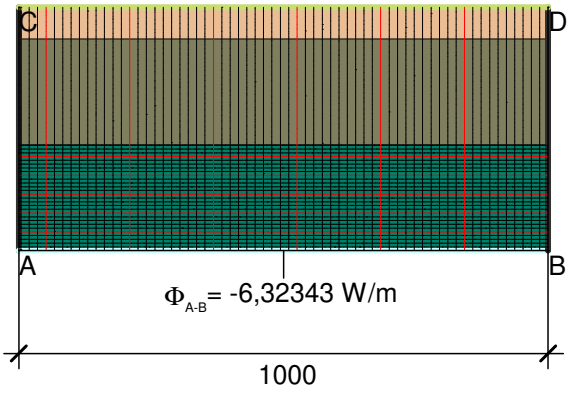
U-value: **0,211** W/(m²K)

Appendix 2: Thermal simulations | Wärmestromsimulationen

Passive House Institute

Wall, roof, ground | Wand, Dach, Boden
Windows | Fenster

Wall, roof, ground | Wand, Dach, Boden

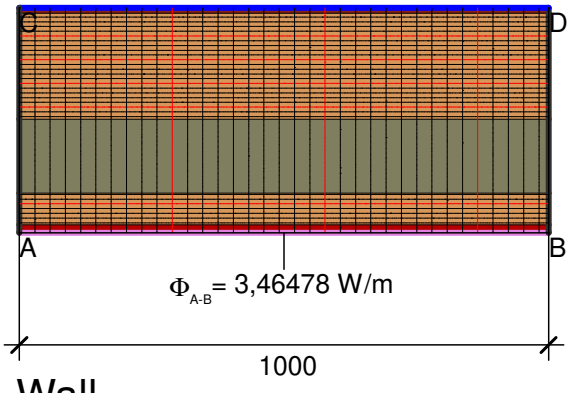


Floor

Material	λ[W/(m·K)]	ε
Cement screed I Zement-Estrich 4108	1,400	0,900
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
Unidek EPS150 034	0,045	0,900

Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Gorund I Erdreich	-10,000	
Int. flux down I Innen abwärts	20,000	0,170

$$U_{eq\ A\text{-}B} = \frac{\Phi}{\Delta T \cdot b} = \frac{6,323}{30,000 \cdot 1,000} = 0,211\ W/(m^2 \cdot K)$$

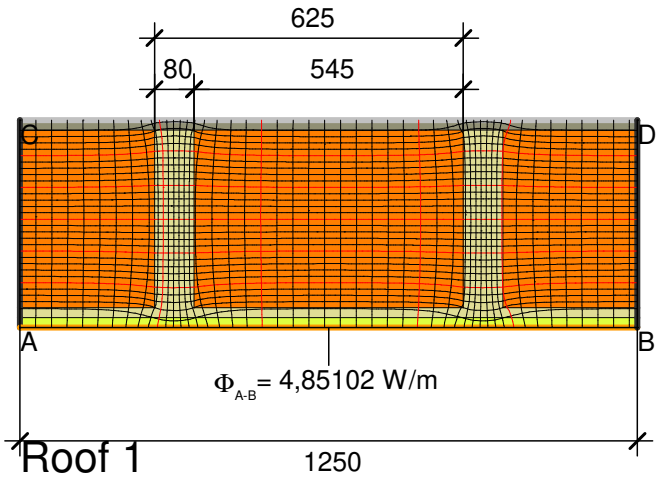


Wall

Material	λ[W/(m·K)]	ε
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900

Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Exterior | Außen	-10,000	0,040
Interior | Innen	20,000	0,130

$$U_{eq\ A\text{-}B} = \frac{\Phi}{\Delta T \cdot b} = \frac{3,465}{30,000 \cdot 1,000} = 0,115\ W/(m^2 \cdot K)$$

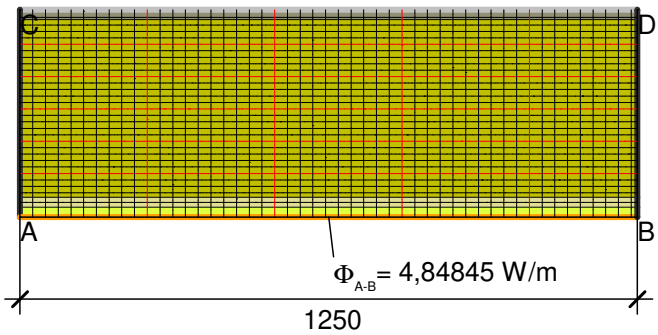


Roof 1

Material	λ[W/(m·K)]	ε
Gypsum board I Gipskartonplatten 900 kg/m3 10456	0,250	0,900
Insulation I Wärmedämmung 040	0,040	0,900
Softwood, OSB I Weichholz, OSB 10456	0,130	0,900
Woodfibre board I Holzfaserplatte 400 kg/m3	0,100	0,900

Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Exterior roof | Außen Dach	-10,000	0,100
Interior up. | Innen auf.	20,000	0,100

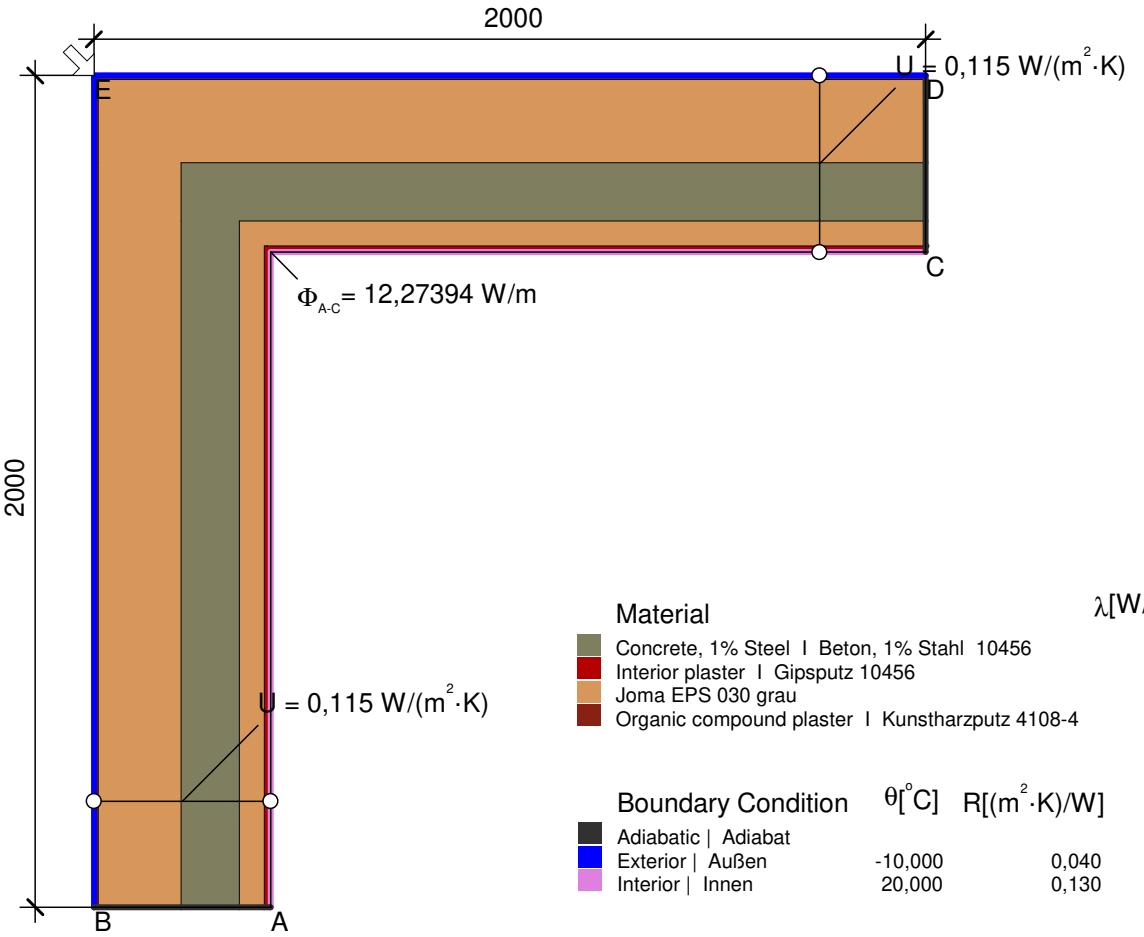
$$U_{eq\ A\text{-}B} = \frac{\Phi}{\Delta T \cdot b} = \frac{4,851}{30,000 \cdot 1,250} = 0,129\ W/(m^2 \cdot K)$$



Roof 1 abstract

Material	λ[W/(m·K)]	ε
EQ-insulation-roof	0,051	0,900
Gypsum board I Gipskartonplatten 900 kg/m3 10456	0,250	0,900
Softwood, OSB I Weichholz, OSB 10456	0,130	0,900
Woodfibre board I Holzfaserplatte 400 kg/m3	0,100	0,900

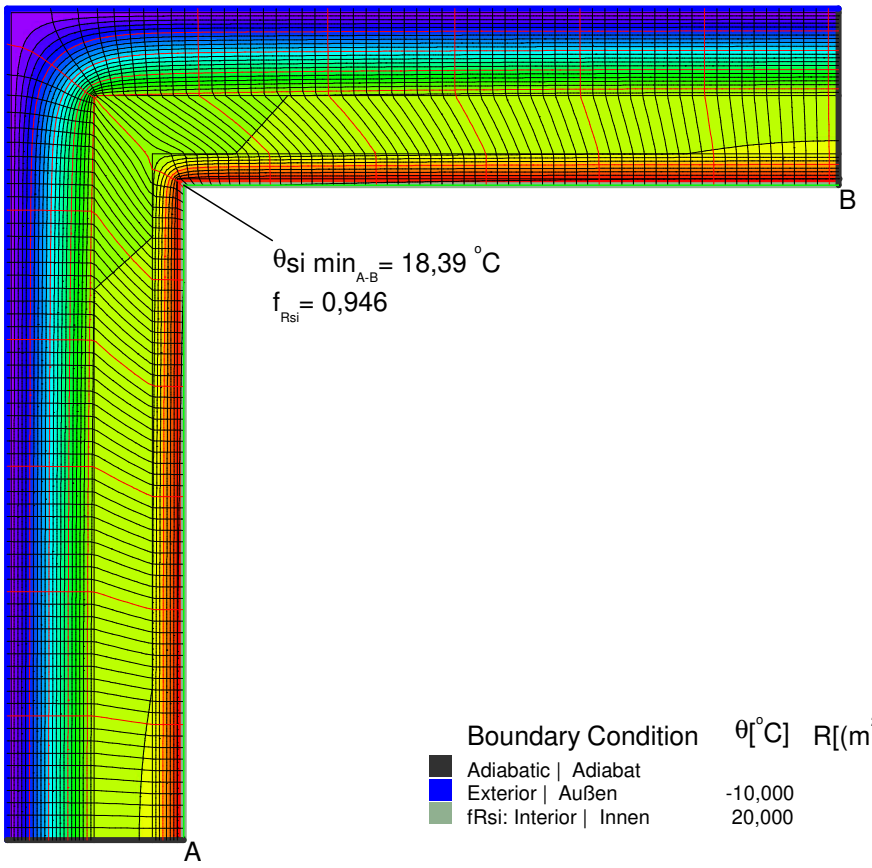
$$U_{eq\ A\text{-}B} = \frac{\Phi}{\Delta T \cdot b} = \frac{4,848}{30,000 \cdot 1,250} = 0,129\ W/(m^2 \cdot K)$$

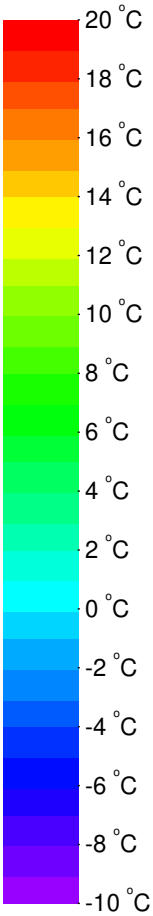


Material	λ[W/(m·K)]	ε
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900

Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Exterior | Außen	-10,000	0,040
Interior | Innen	20,000	0,130

$$\psi_{A\text{-}E\text{-}C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{12,274}{30,000} - 0,115 \cdot 2,000 - 0,115 \cdot 2,000 = -0,053 \text{ W/(m·K)}$$

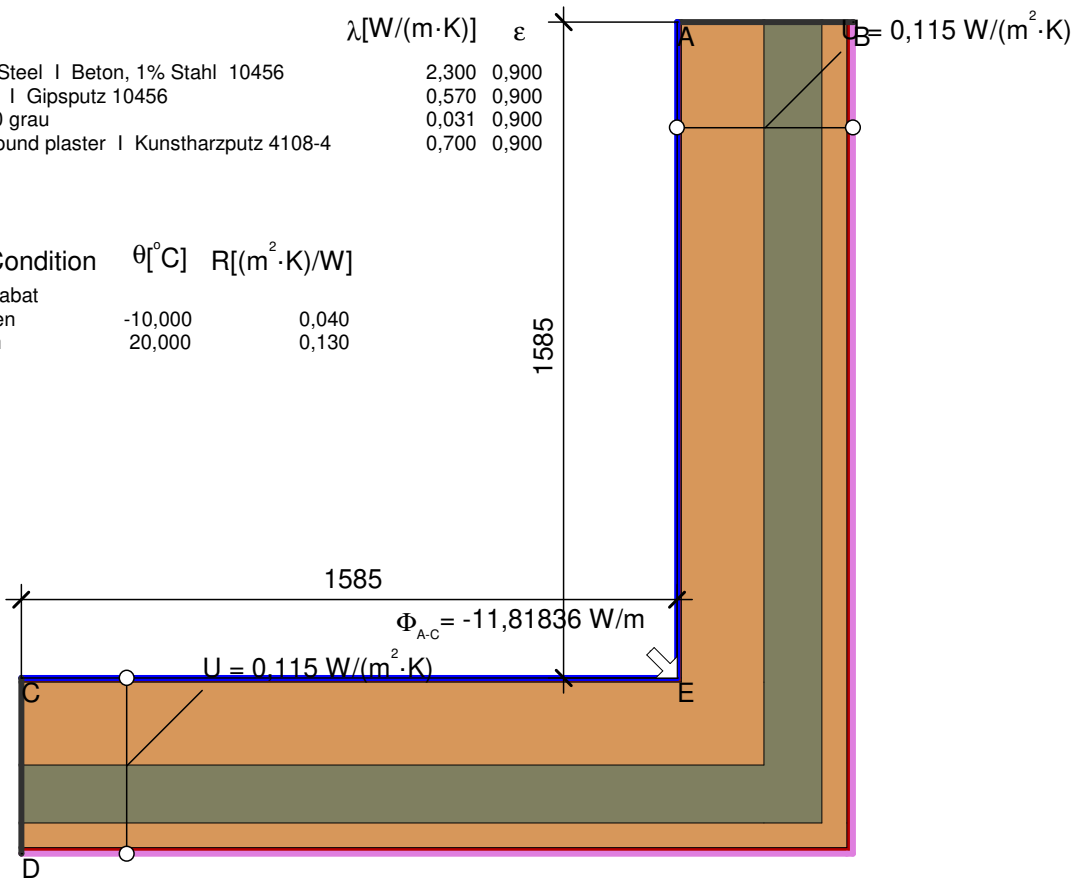




Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Exterior | Außen	-10,000	0,040
fRsi: Interior | Innen	20,000	0,250

Material	λ[W/(m·K)]	ε
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900

Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Exterior | Außen	-10,000	0,040
Interior | Innen	20,000	0,130

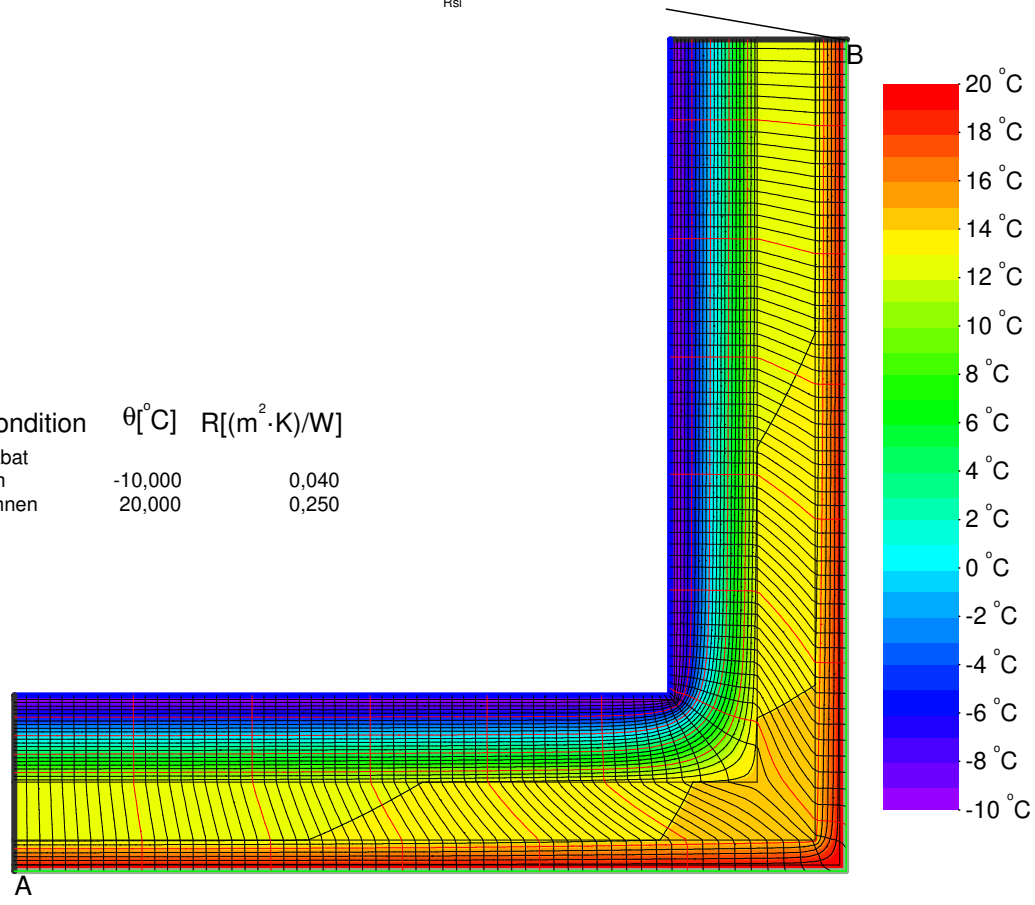


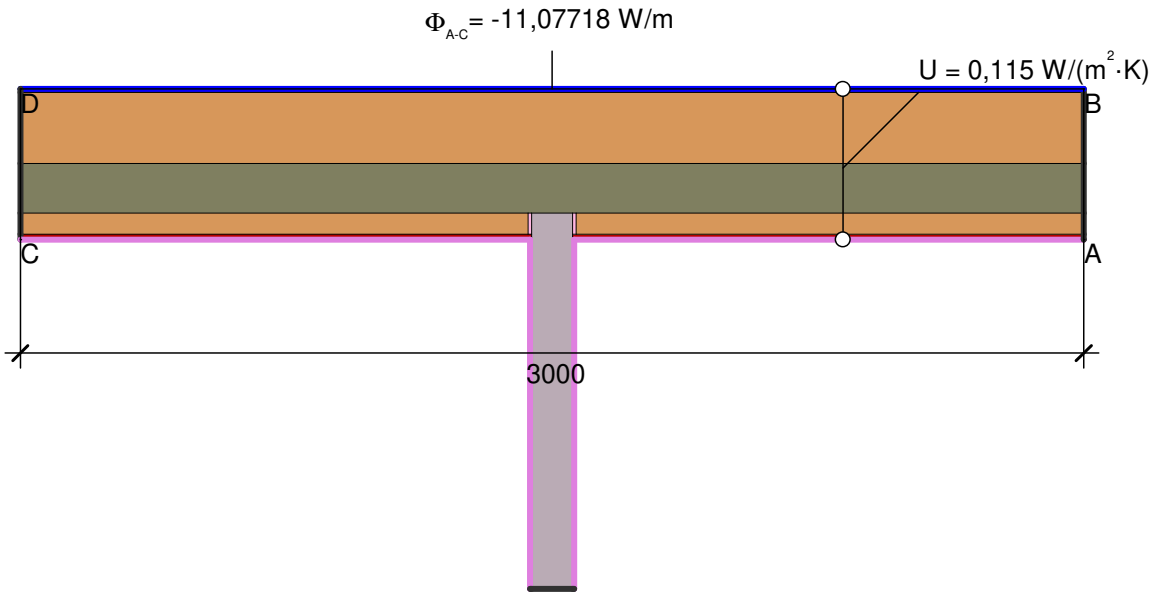
$$\psi_{A\text{-}E\text{-}C,*} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{11{,}818}{30{,}000} - 0{,}115 \cdot 1{,}585 - 0{,}115 \cdot 1{,}585 = 0{,}028 \text{ W/(m·K)}$$

$\theta_{si\ min\ A\text{-}B}$ = 19,19 °C

f_{Rsi} = 0,973

Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Exterior | Außen	-10,000	0,040
fRsi: Interior | Innen	20,000	0,250

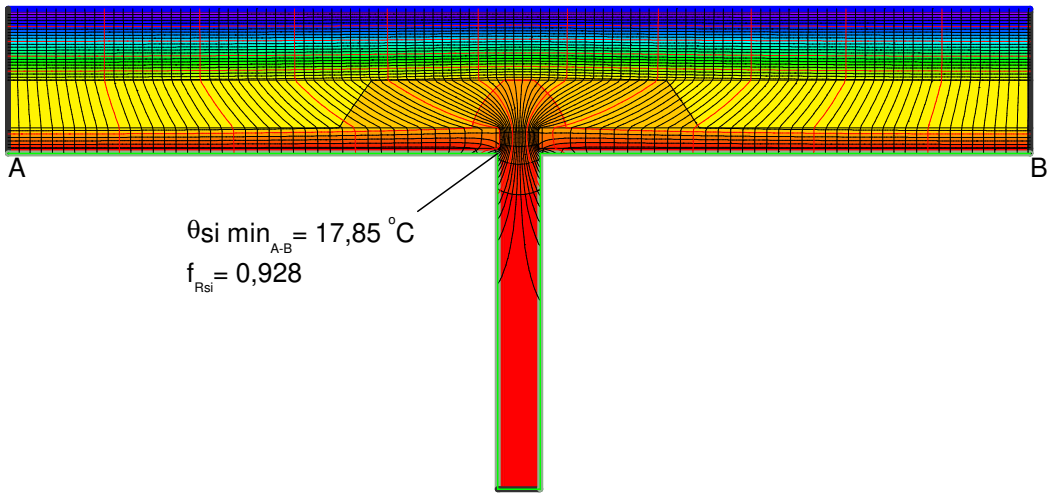


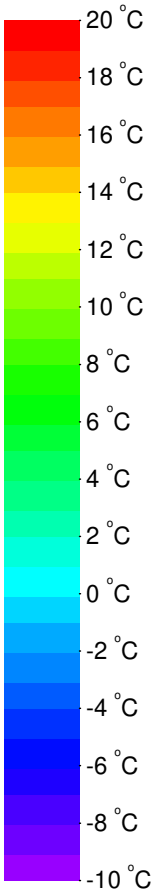


$$\psi_{A-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 = \frac{11,077}{30,000} - 0,115 \cdot 3,000 = 0,023 \text{ W/(m·K)}$$

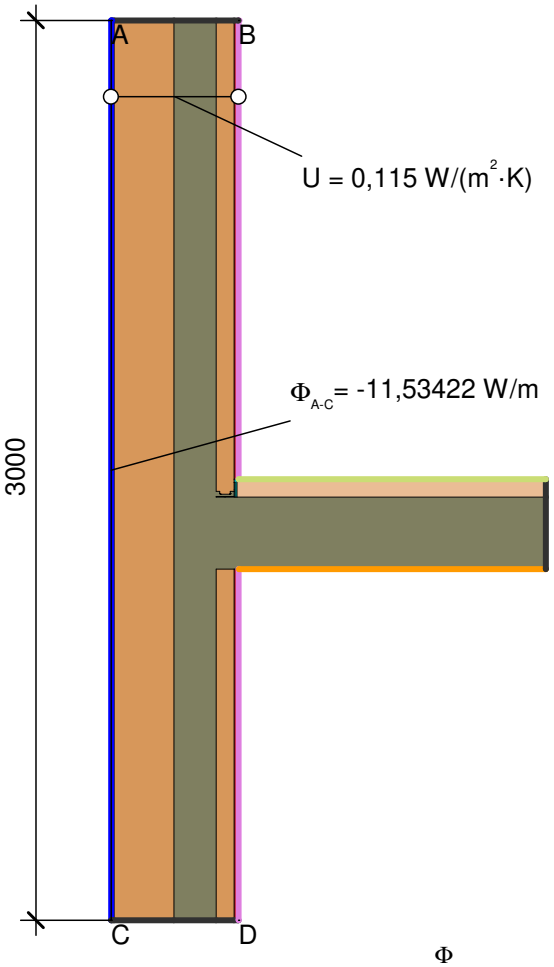
Material	λ[W/(m·K)]	ε
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900
PU in-situ foam I PU-Ortschaum 040	0,040	0,900
Sand-lime stone I Kalksandstein 1745	1,000	0,900

Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Exterior | Außen	-10,000	0,040
Interior | Innen	20,000	0,130





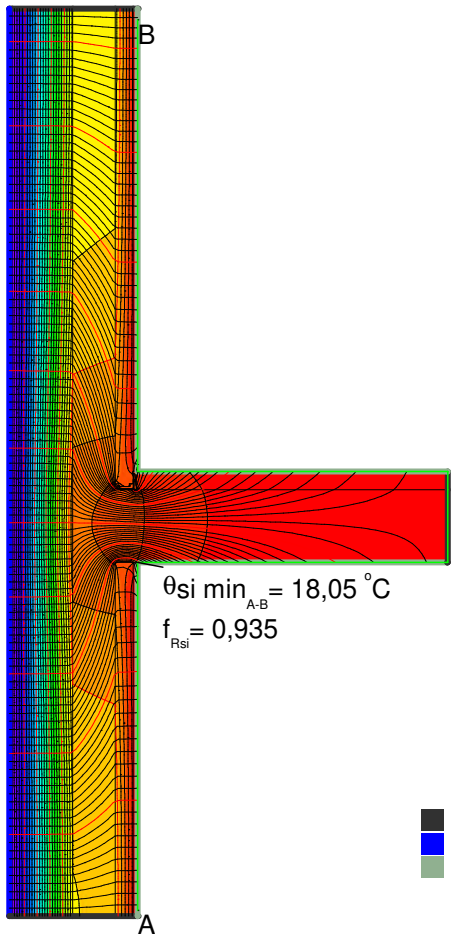
Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat	0,000			
Exterior | Außen		-10,000	0,040	
fRsi: Interior | Innen		20,000	0,250	



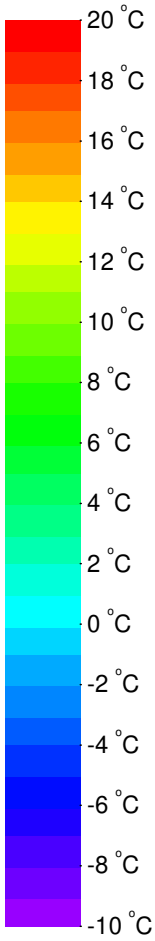
Material	λ[W/(m·K)]	ε
Cement screed I Zement-Estrich 4108	1,400	0,900
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
Insulation I Wärmedämmung 035	0,035	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900
Steel I Stahl	50,000	0,900

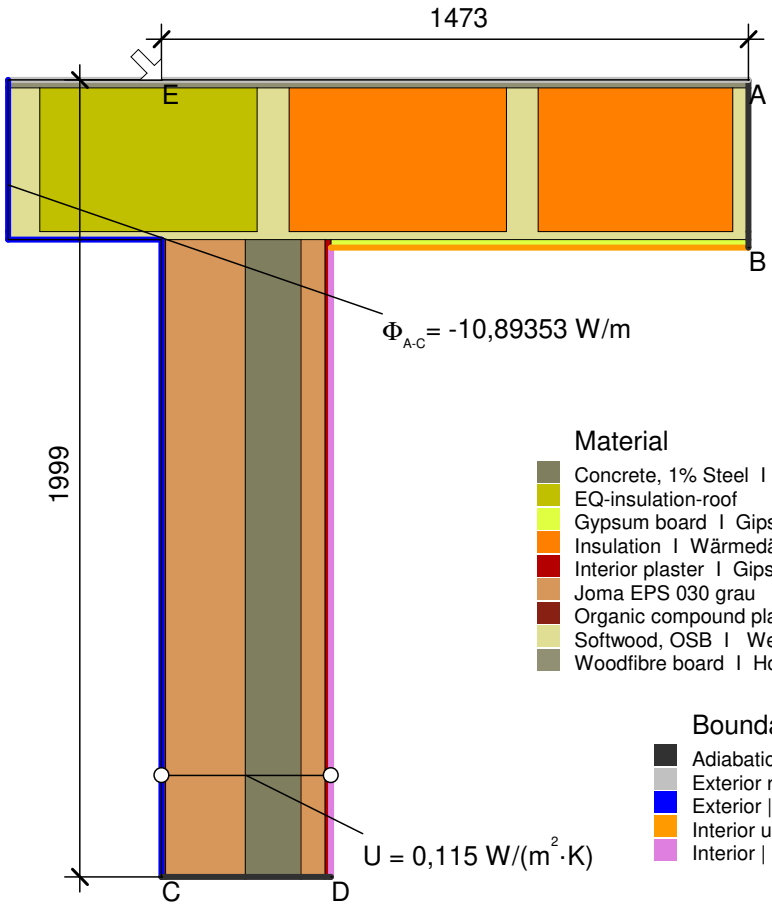
Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat			
Exterior | Außen	-10,000	0,040	
Int. flux down I Innen abwärts	20,000	0,170	
Interior up. | Innen auf.	20,000	0,100	
Interior | Innen	20,000	0,130	

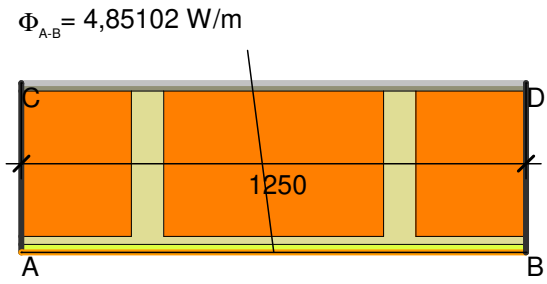
$$\psi_{A-C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 = \frac{11,534}{30,000} - 0,115 \cdot 3,000 = 0,038 \text{ W/(m·K)}$$



Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat			
Exterior | Außen	-10,000	0,040	
fRsi: Interior | Innen	20,000	0,250	





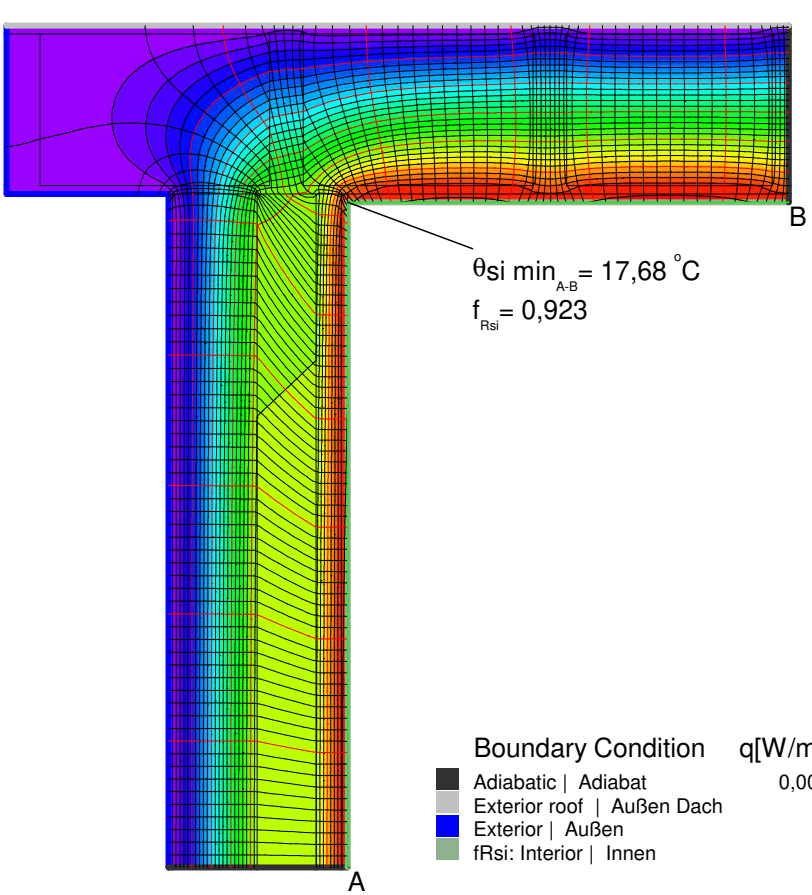


$$U_{eq\ A-B} = \frac{\Phi}{\Delta T \cdot b} = \frac{4{,}851}{30{,}000 \cdot 1{,}250} = 0{,}129\ W/(m^2 \cdot K)$$

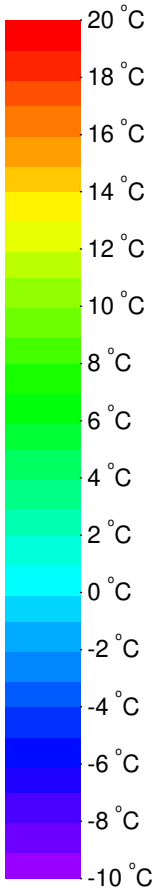
Material	λ[W/(m·K)]	ε
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
EQ-insulation-roof	0,051	0,900
Gypsum board I Gipskartonplatten 900 kg/m3 10456	0,250	0,900
Insulation I Wärmedämmung 040	0,040	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900
Softwood, OSB I Weichholz, OSB 10456	0,130	0,900
Woodfibre board I Holzfaserplatte 400 kg/m3	0,100	0,900

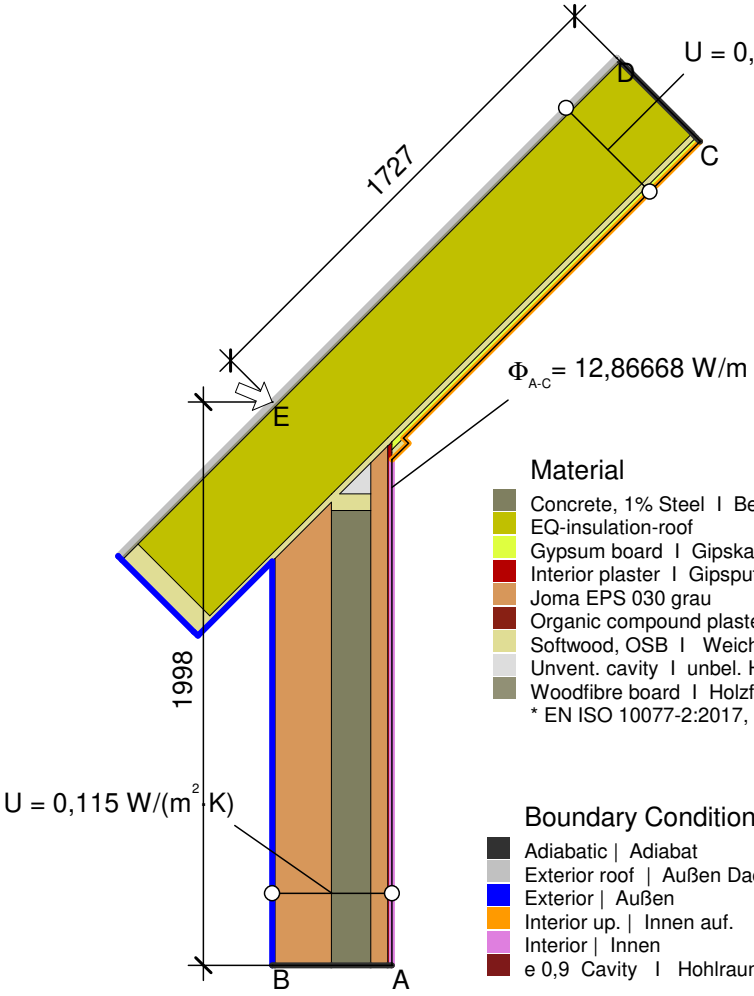
Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Adiabatic I Adiabat			
Exterior roof I Außen Dach	-10,000	0,100	
Exterior I Außen	-10,000	0,040	
Interior up. I Innen auf.	20,000	0,100	
Interior I Innen	20,000	0,130	

$$\psi_{A-E-C,*} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{10{,}894}{30{,}000} - 0{,}129 \cdot 1{,}473 - 0{,}115 \cdot 1{,}999 = -0{,}058\ W/(m \cdot K)$$



Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε
Adiabatic I Adiabat	0,000			
Exterior roof I Außen Dach		-10,000	0,100	
Exterior I Außen		-10,000	0,040	
fRsi: Interior I Innen		20,000	0,250	



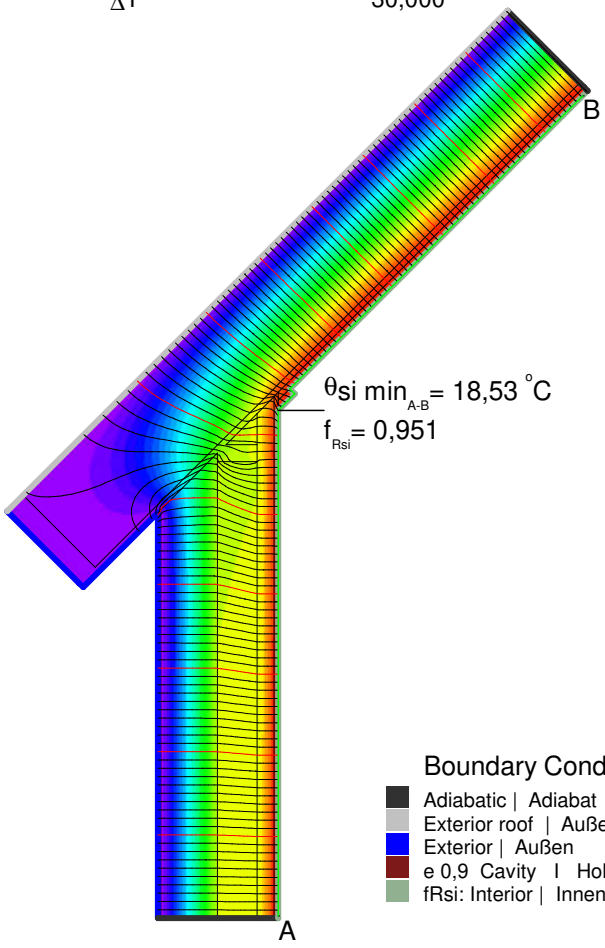


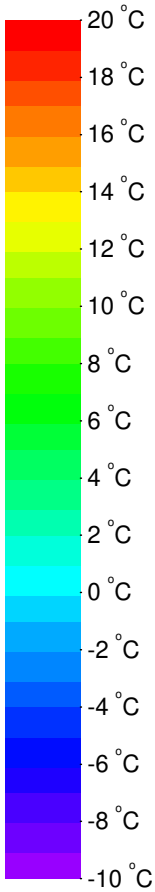
Material	λ[W/(m·K)]	ε
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
EQ-insulation-roof	0,051	0,900
Gypsum board I Gipskartonplatten 900 kg/m3 10456	0,250	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900
Softwood, OSB I Weichholz, OSB 10456	0,130	0,900
Unvent. cavity I unbel. Hohlr. *		
Woodfibre board I Holzfaserplatte 400 kg/m3	0,100	0,900

* EN ISO 10077-2:2017, 6.4.3

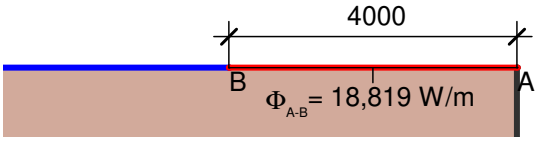
Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Adiabatic I Adiabat			
Exterior roof I Außen Dach	-10,000	0,100	
Exterior I Außen	-10,000	0,040	
Interior up. I Innen auf.	20,000	0,100	
Interior I Innen	20,000	0,130	
e 0,9 Cavity I Hohlraum			0,900

$$\psi_{A\text{-}E\text{-}C} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - U_2 \cdot b_2 = \frac{12{,}867}{30{,}000} - 0{,}115 \cdot 1{,}998 - 0{,}129 \cdot 1{,}727 = -0{,}025 \text{ W/(m·K)}$$

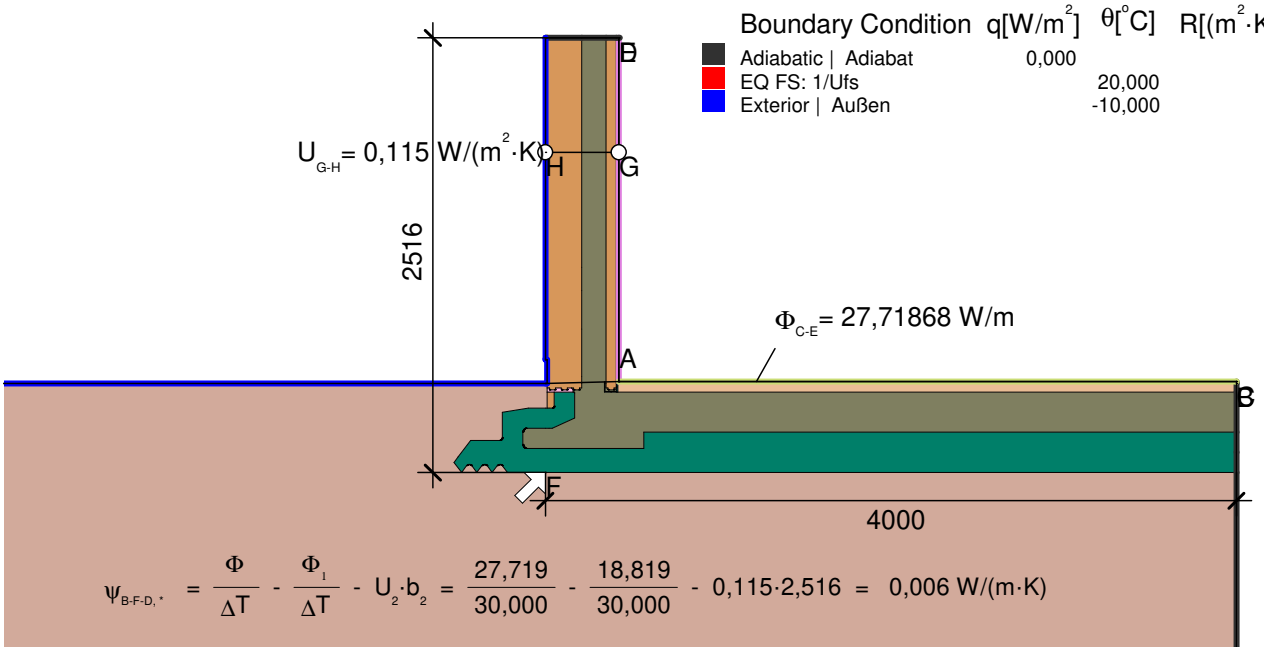




Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε
Adiabatic I Adiabat	0,000			
Exterior roof I Außen Dach		-10,000	0,100	
Exterior I Außen		-10,000	0,040	
e 0,9 Cavity I Hohlraum				0,900
fRsi: Interior I Innen		20,000	0,250	



Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat	0,000			
EQ FS: 1/Ufs		20,000	4,744	
Exterior | Außen		-10,000	0,040	



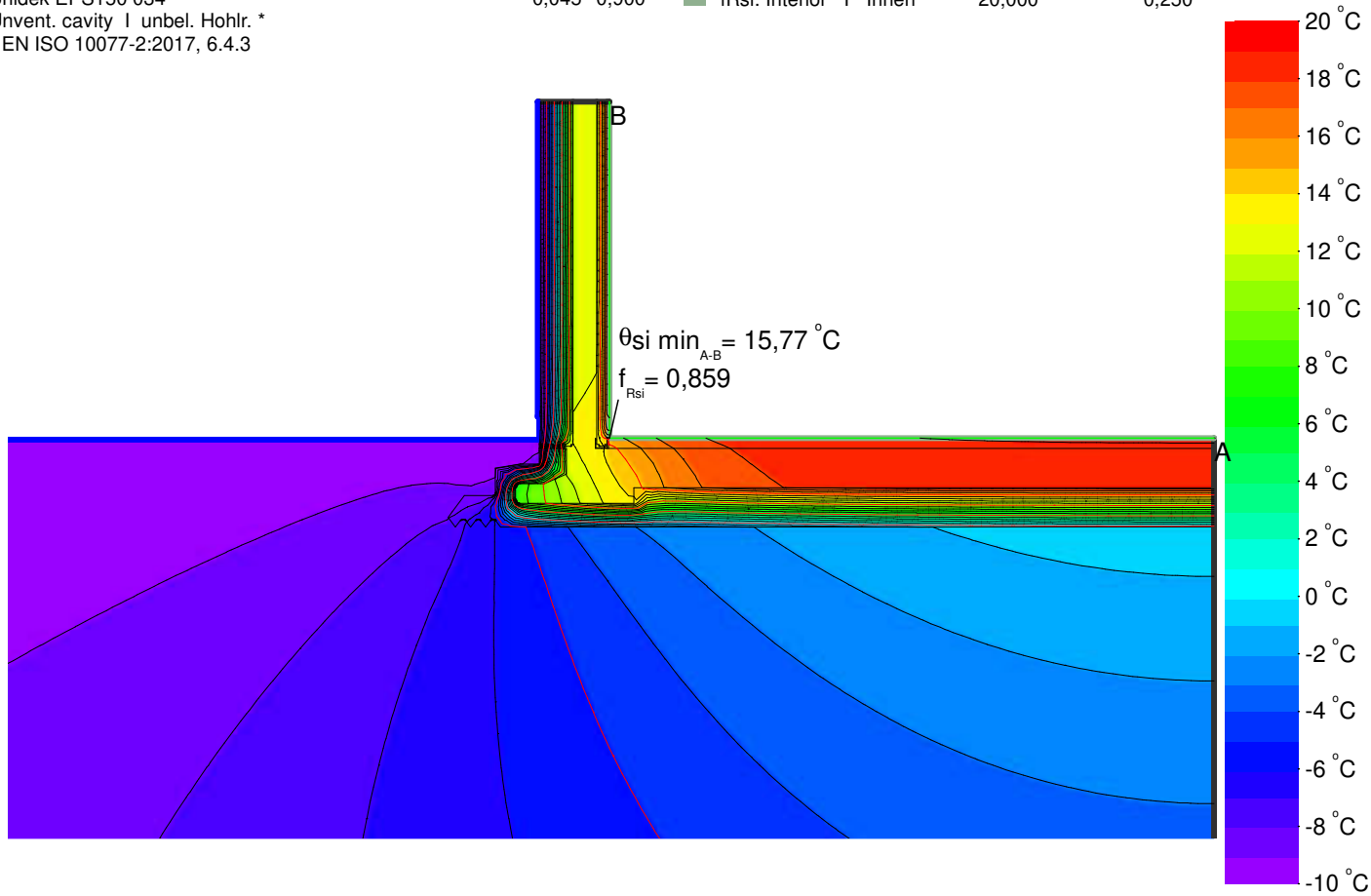
$$\psi_{B\text{-}F\text{-}D,*} = \frac{\Phi}{\Delta T} - \frac{\Phi_i}{\Delta T} - U_2 \cdot b_2 = \frac{27{,}719}{30{,}000} - \frac{18{,}819}{30{,}000} - 0{,}115 \cdot 2{,}516 = 0{,}006 \text{ W/(m·K)}$$

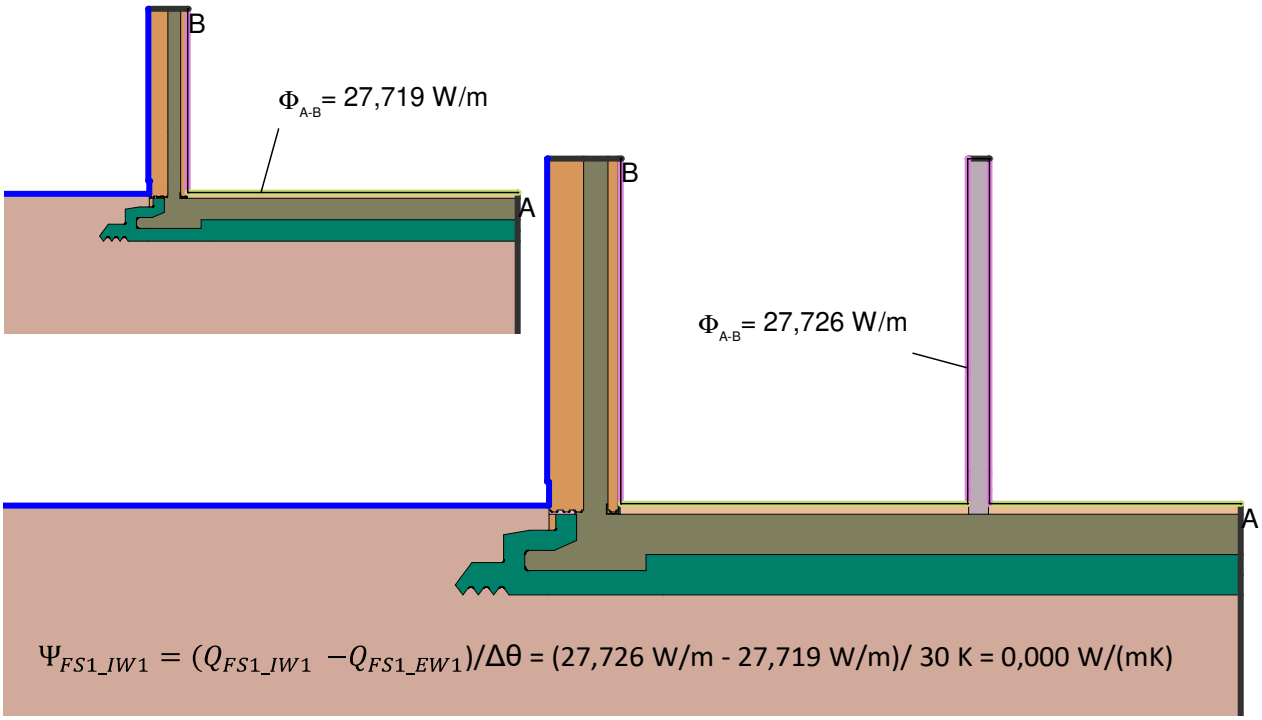
Material	λ[W/(m·K)]	ε
Cement screed I Zement-Estrich 4108	1,400	0,900
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
Ground I Erdreich	2,000	0,900
Insulation I Wärmedämmung 035	0,035	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900
PU in-situ foam I PU-Ortschaum 040	0,040	0,900
Polyvinylchloride (PVC)	0,170	0,900
Steel I Stahl	50,000	0,900
Unidek EPS150 034	0,045	0,900
Unvent. cavity I unbel. Hohlr. *		

* EN ISO 10077-2:2017, 6.4.3

Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Exterior | Außen	-10,000	0,040
Int. flux down I Innen abwärts	20,000	0,170
Interior | Innen	20,000	0,130

Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Exterior, normal	-10,000	0,040
fRsi: Interior I Innen	20,000	0,250



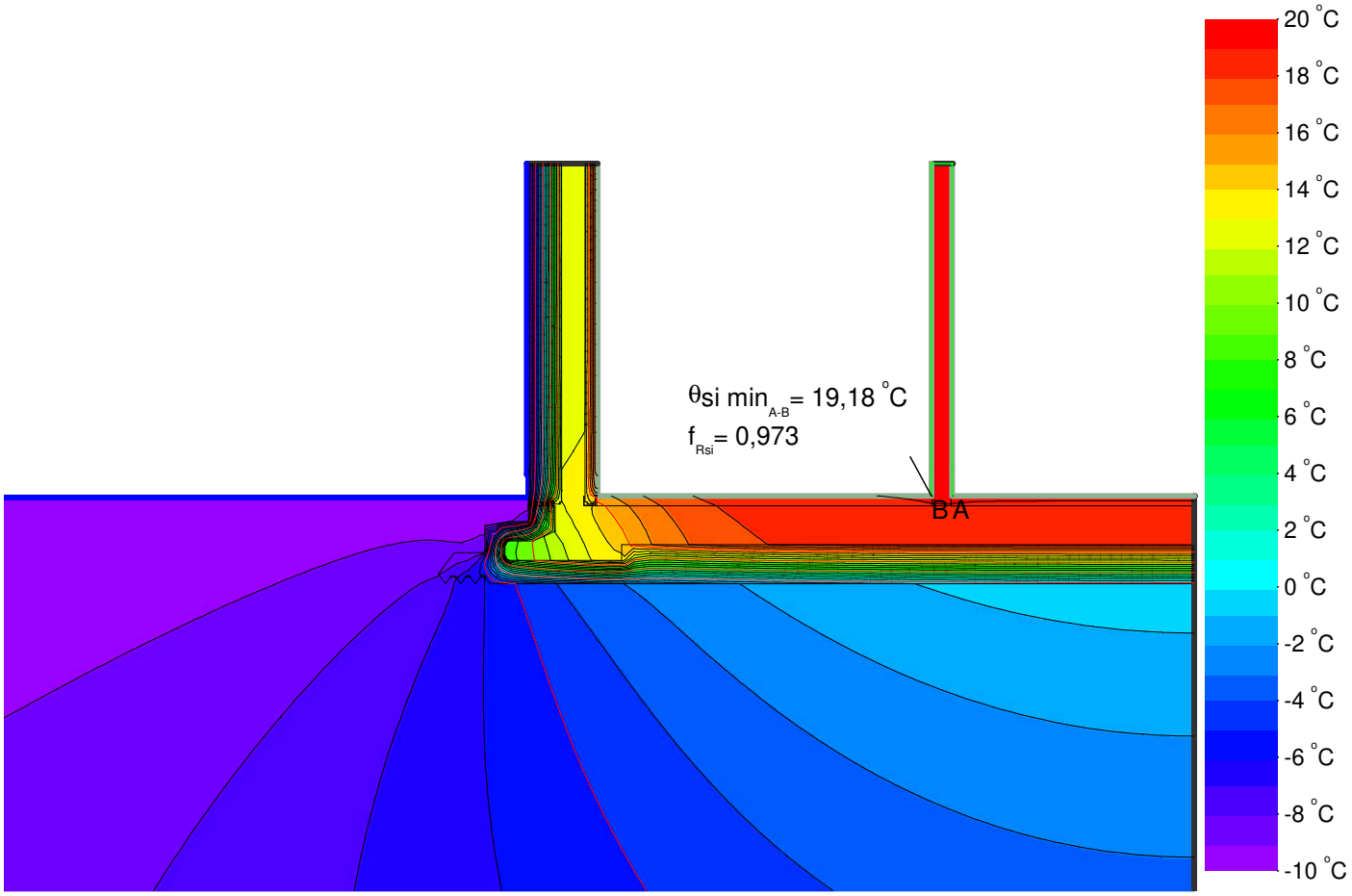


Material	λ[W/(m·K)]	ε
Cement screed I Zement-Estrich 4108	1,400	0,900
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
Ground I Erdreich	2,000	0,900
Insulation I Wärmedämmung 035	0,035	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900
PU in-situ foam I PU-Ortschaum 040	0,040	0,900
Polyvinylchloride (PVC)	0,170	0,900
Sand-lime stone I Kalksandstein 1745	1,000	0,900
Steel I Stahl	50,000	0,900
Unidek EPS150 034	0,045	0,900
Unvent. cavity I unbel. Hohlr. *		

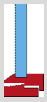
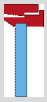
* EN ISO 10077-2:2017, 6.4.3

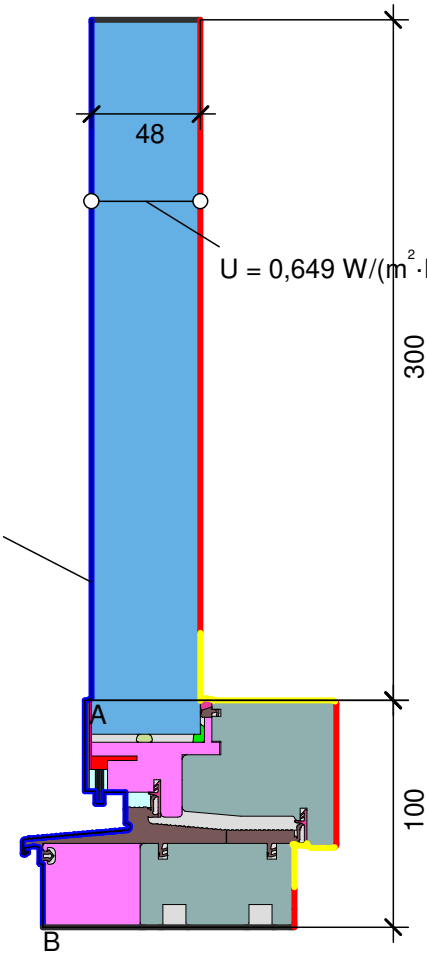
Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Exterior | Außen	-10,000	0,040
Int. flux down I Innen abwärts	20,000	0,170
Interior I Innen	20,000	0,130
Interior | Innen	20,000	0,130

Boundary Condition	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat		
Exterior | Außen	-10,000	0,040
fRsi: Interior I Innen	20,000	0,250



Windows | Fenster

	ENERsign		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 barri-erefrei
	Spacer I Abstandhalter: Swisspacer Ultimate with PU secondary seal											
	Frame width Rahmenbreite	b_f [mm]	100	100	100							100
	U-value frame Rahmen-U-Wert	**Uf** [W/(m²K)]	0,63	0,63	0,63							1,07
	Ψ-glass edge Glasrand-Ψ-Wert	**Ψg** [W/(mK)]	0,019	0,019	0,019							0,021
	U-value window Fenster-U-Wert	**Uw** [W/(m²K)] @U_g = 0,52 W/(m²K)	**0,73**									
	Passive House effiziency class Passivhaus Effizienzklasse		**phA**									
Installation | Einbau												
		$f_{Rsi=0,25m²k/W}$	0,749	0,749	0,749							0,695
		$\Psi_{install}$ [W/(mK)]	0,032	-0,003	-0,001							0,143
		$U_{W,\ installed}$ [W/(m²K)]	0,75									



Φ_{-B} = -9,03896 W/m

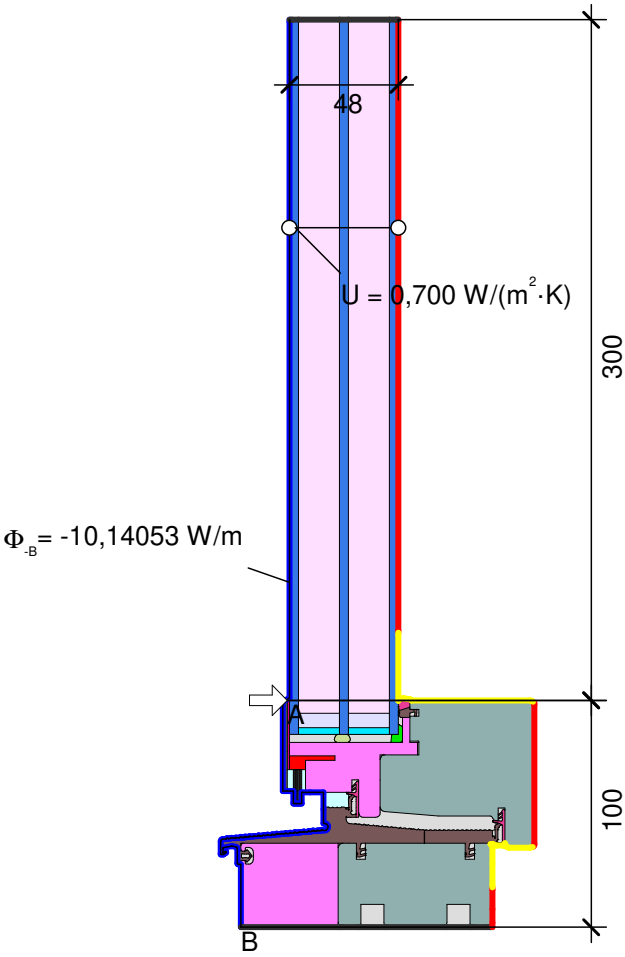
Material	λ[W/(m·K)]	ε
Aluminum I Aluminium 10456	160,000	0,900
ENERcell	0,060	0,900
EPDM	0,250	0,900
EPDM foam | Moosgummi	0,050	0,900
Glue I Klebestoff	0,310	0,900
PE-Insulation I Wärmedämmung 035	0,035	0,900
Panel I Maske	0,035	0,900
Polyamide 25% Glassfiber	0,300	0,900
Silicone I Silikon	0,350	0,900
Spruce, Fir I Fichte, Tanne	0,110	0,900
Unvent. cavity I unbel. Hohlr. *		
slightly vent. cav. I leicht bel. Hohlr. *		

* EN ISO 10077-2:2017, 6.4.3

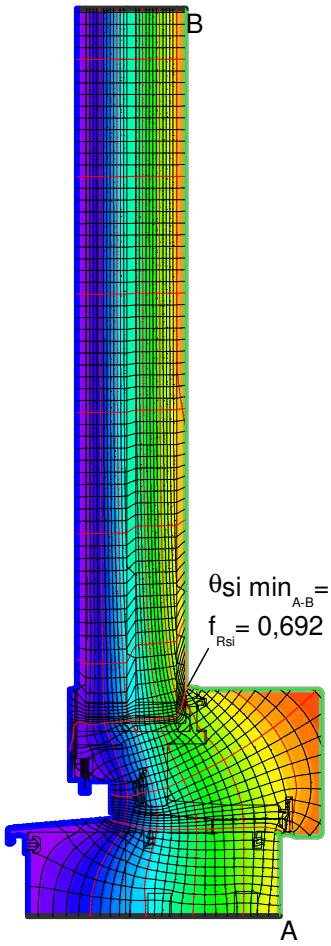
$$U_{f\,A,B} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_f} = \frac{\frac{9{,}039}{30{,}000} - 0{,}649 \cdot 0{,}300}{0{,}100} = 1{,}067\ \mathrm{W/(m^2 \cdot K)}$$

Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat			
Exterior | Außen	-10,000	0,040	
Interior, frame, normal	20,000	0,130	
Interior, frame, reduced	20,000	0,200	
e 0,9 Cavity I Hohlraum			0,900

Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat			
Exterior | Außen	-10,000	0,040	
e 0,9 Cavity I Hohlraum			0,900
fRsi: Interior | Innen	20,000	0,250	

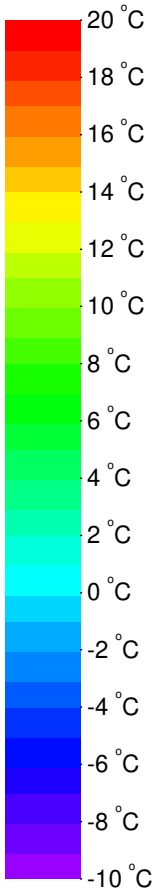


Φ_{-B} = -10,14053 W/m

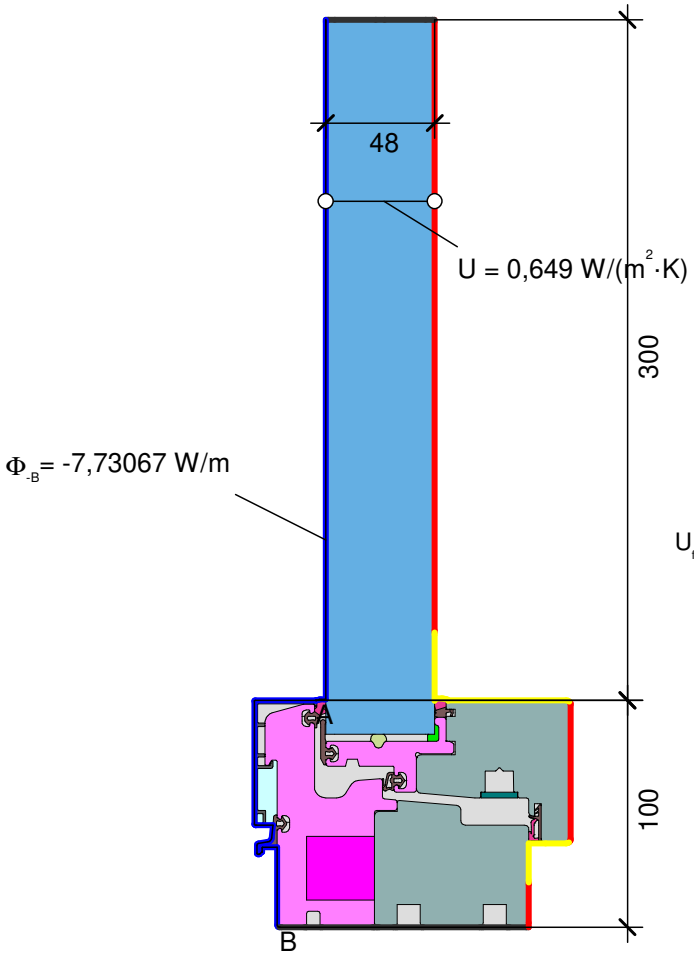


$\theta si\ min_{A-B}$ = 10,75 °C

f_{Rsi} = 0,692



$$\Psi_{ed\,A} = \frac{\Phi}{\Delta T} - U_g \cdot b_g - U_f \cdot b_f = \frac{10{,}141}{30{,}000} - 0{,}700 \cdot 0{,}300 - 1{,}067 \cdot 0{,}100 = 0{,}021\ \mathrm{W/(m \cdot K)}$$



Φ_{-B} = -7,73067 W/m

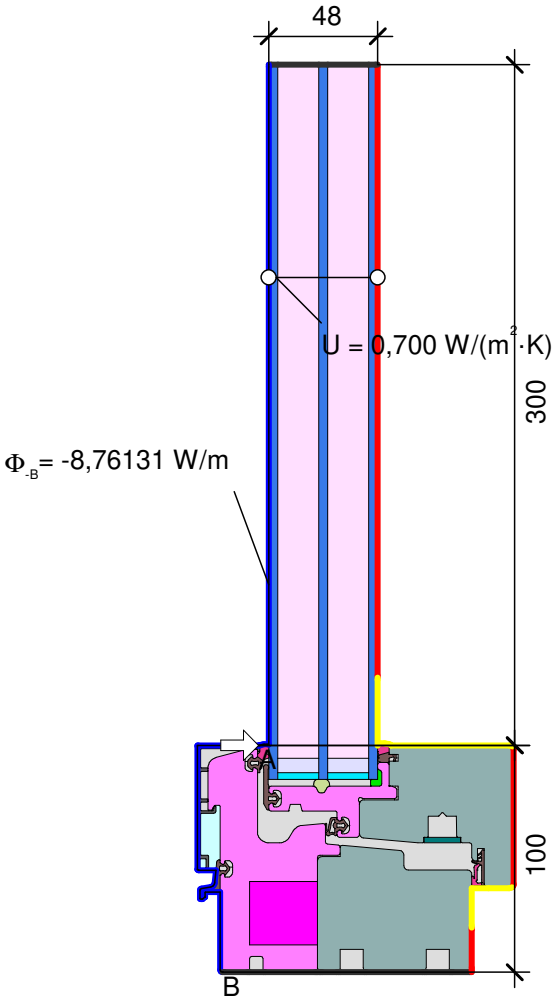
Material	λ[W/(m·K)]	ε
Aluminum I Aluminium 10456	160,000	0,900
ENERcell	0,060	0,900
EPDM	0,250	0,900
EPDM foam | Moosgummi	0,050	0,900
Glue I Klebestoff	0,310	0,900
Insulation Wärmedämmung 032	0,032	0,900
PE-Insulation I Wärmedämmung 035	0,035	0,900
Panel I Maske	0,035	0,900
Spruce, Fir I Fichte, Tanne	0,110	0,900
Steel I Stahl	50,000	0,900
Unvent. cavity I unbel. Hohlr. *		
slightly vent. cav. I leicht bel. Hohlr. *		

* EN ISO 10077-2:2017, 6.4.3

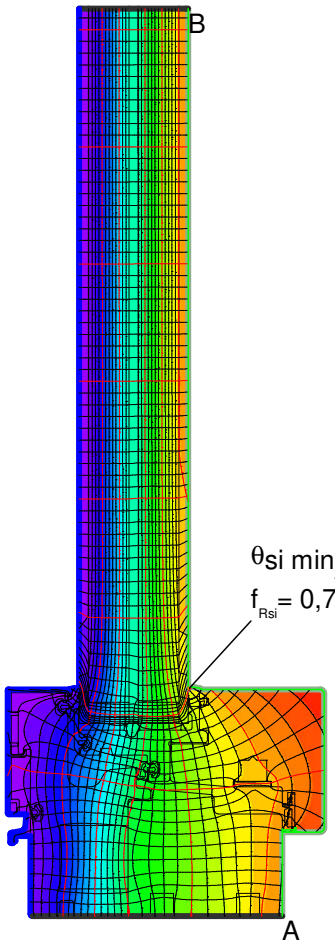
$$U_{f\,A,B} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_f} = \frac{\frac{7{,}731}{30{,}000} - 0{,}649 \cdot 0{,}300}{0{,}100} = 0{,}631\ \text{W/(m}^2\text{·K)}$$

Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat			
Exterior | Außen	-10,000	0,040	
Interior, frame, normal	20,000	0,130	
Interior, frame, reduced	20,000	0,200	
e 0,9 Cavity I Hohlraum			0,900

Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat			
Exterior | Außen	-10,000	0,040	
e 0,9 Cavity I Hohlraum			0,900
fRsi: Interior | Innen	20,000	0,250	

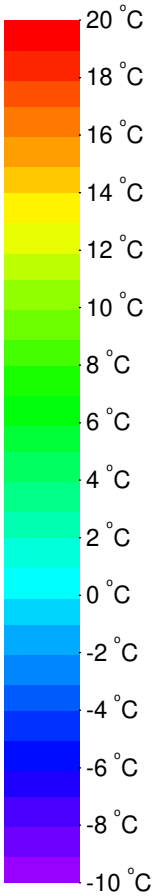


Φ_{-B} = -8,76131 W/m

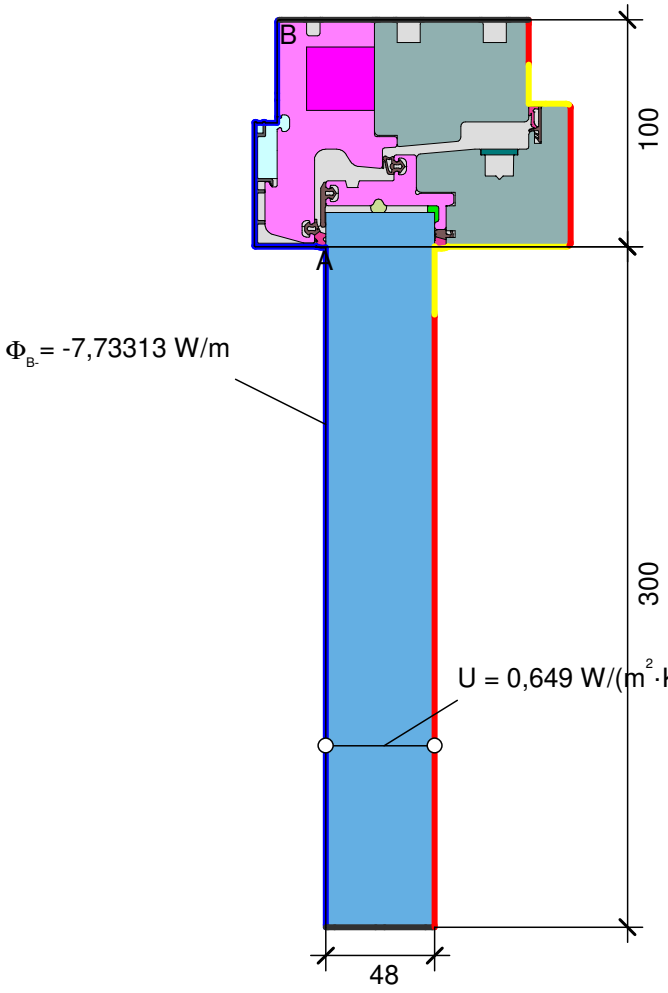


$\theta_{si\ min_{A-B}}$ = 12,48 °C

f_{Rsi} = 0,749



$$\psi_{ed\,A} = \frac{\Phi}{\Delta T} - U_g \cdot b_g - U_f \cdot b_f = \frac{8{,}761}{30{,}000} - 0{,}700 \cdot 0{,}300 - 0{,}631 \cdot 0{,}100 = 0{,}019\ \text{W/(m·K)}$$



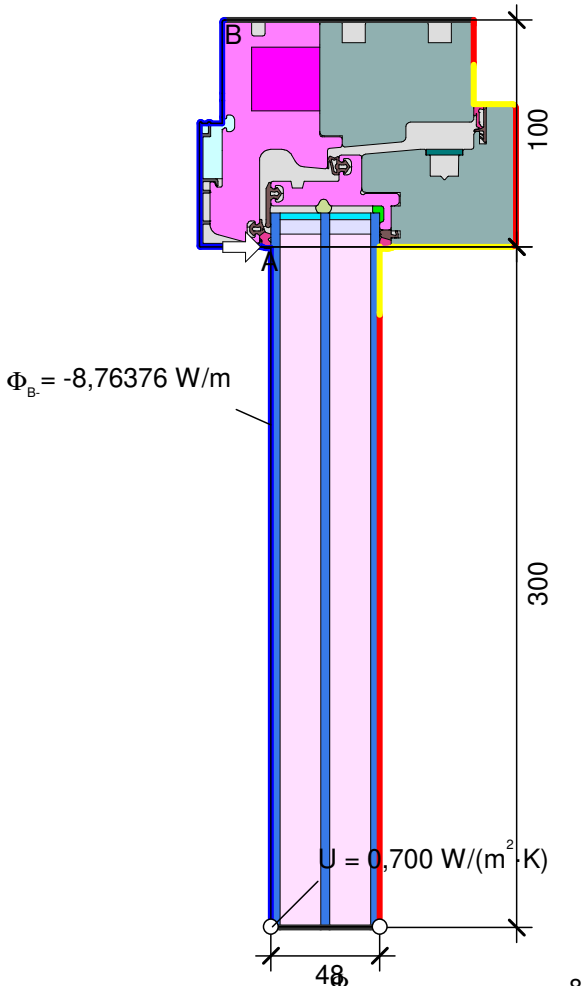
Material	λ[W/(m·K)]	ε
Aluminum I Aluminium 10456	160,000	0,900
ENERcell	0,060	0,900
EPDM	0,250	0,900
EPDM foam | Moosgummi (1)	0,050	0,900
Glue I Klebestoff	0,310	0,900
Insulation Wärmedämmung 032	0,032	0,900
PE-Insulation I Wärmedämmung 035	0,035	0,900
Panel I Maske	0,035	0,900
Spruce, Fir I Fichte, Tanne	0,110	0,900
Steel I Stahl	50,000	0,900
Unvent. cavity I unbel. Hohlr. *		
slightly vent. cav. I leicht bel. Hohlr. *		

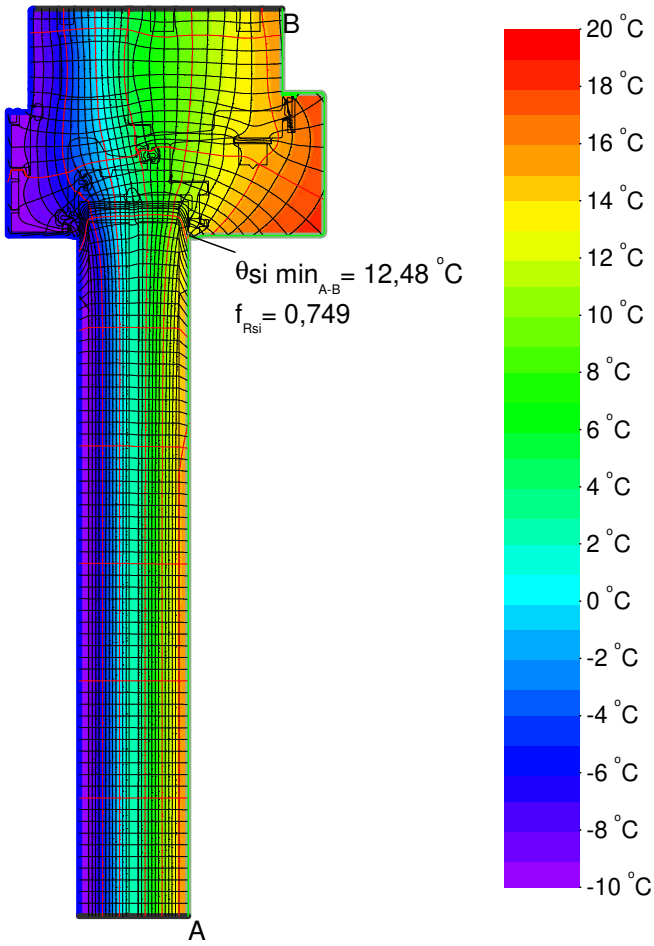
* EN ISO 10077-2:2017, 6.4.3

$$U_{f\,A,B} = \frac{\frac{\Phi}{\Delta T} - U_p \cdot b_p}{b_f} = \frac{\frac{7{,}733}{30{,}000} - 0{,}649 \cdot 0{,}300}{0{,}100} = 0{,}631\ \mathrm{W/(m^2 \cdot K)}$$

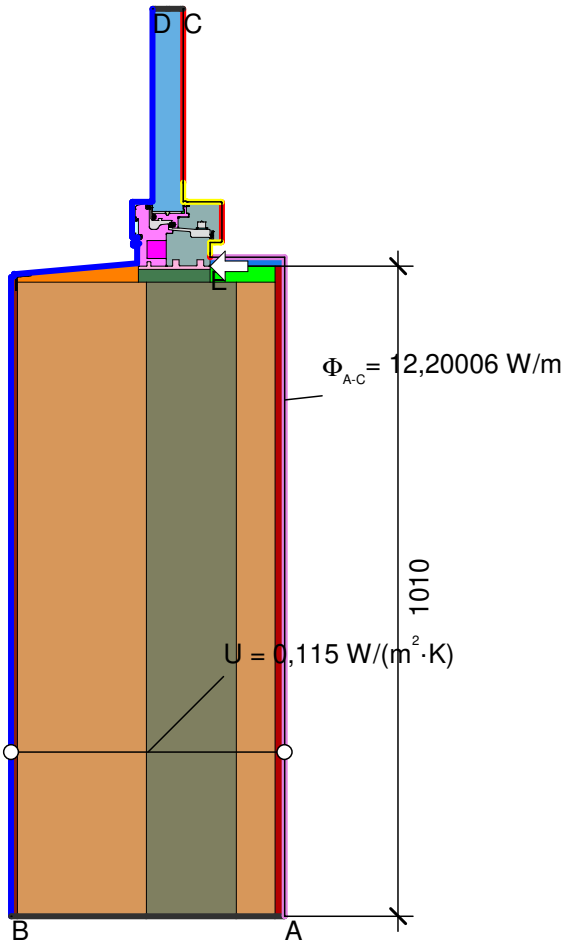
Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat			
Exterior | Außen	-10,000	0,040	
Interior, frame, normal	20,000	0,130	
Interior, frame, reduced	20,000	0,200	
e 0,9 Cavity I Hohlraum			0,900

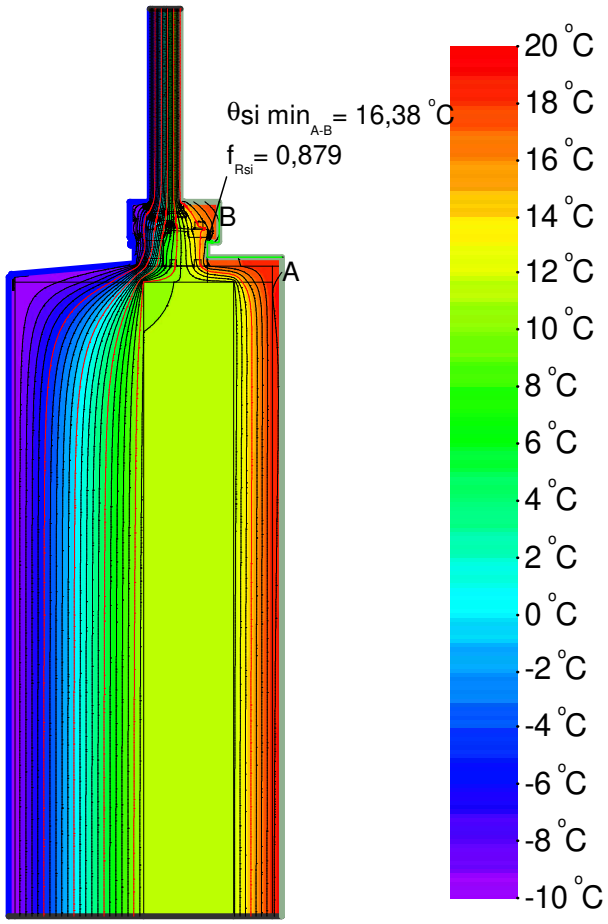
Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat			
Exterior | Außen	-10,000	0,040	
e 0,9 Cavity I Hohlraum			0,900
fRsi: Interior | Innen	20,000	0,250	





$$\Psi_{ed\,A} = \frac{\Phi}{\Delta T} - U_g \cdot b_g - U_f \cdot b_f = \frac{8{,}764}{30{,}000} - 0{,}700 \cdot 0{,}300 - 0{,}631 \cdot 0{,}100 = 0{,}019\ \mathrm{W/(m \cdot K)}$$





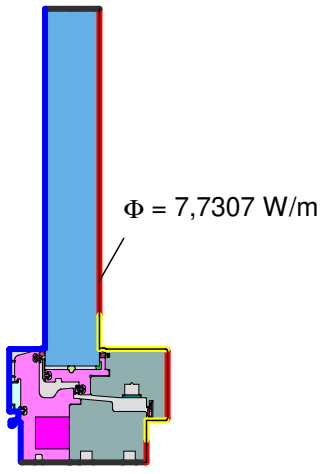
$$\Psi_{A\text{-}E\text{-}C,*} = \frac{\Phi}{\Delta T} - U_1 \cdot b_1 - \frac{\Phi_2}{\Delta T} = \frac{12{,}200}{30{,}000} - 0{,}115 \cdot 1{,}010 - \frac{7{,}731}{30{,}000} = 0{,}032 \text{ W/(m·K)}$$

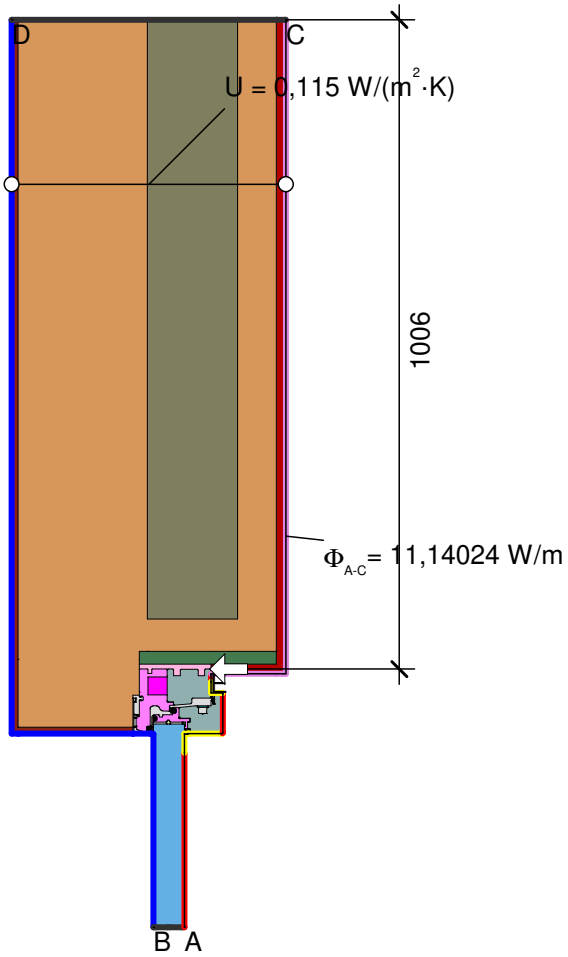
Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat	0,000			
Exterior | Außen		-10,000	0,040	
Interior | Innen		20,000	0,130	
Interior, frame, normal		20,000	0,130	
Interior, frame, reduced		20,000	0,200	
e 0,9 Cavity I Hohlraum				0,900

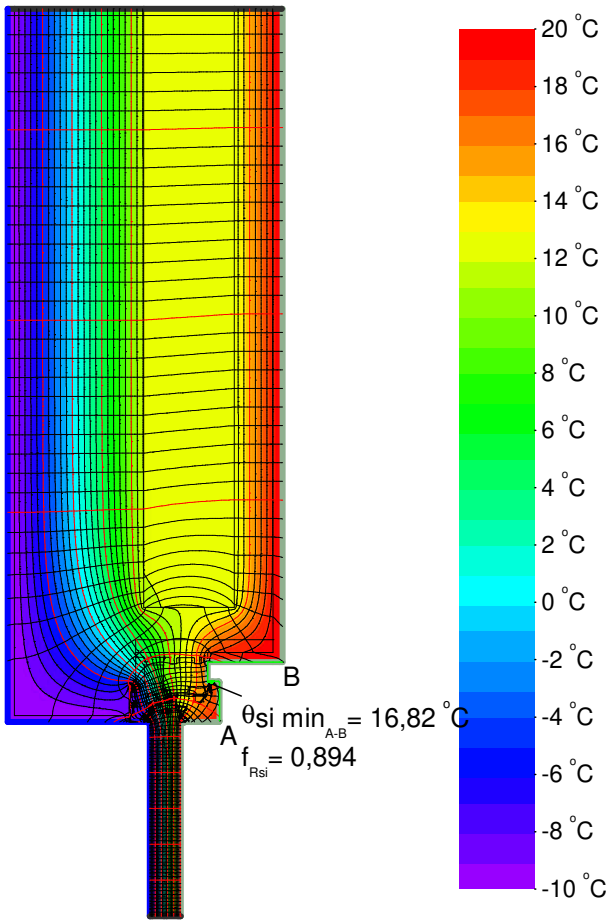
Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Exterior | Außen	-10,000	0,040	
fRsi: Interior | Innen	20,000	0,250	
Adiabatic | Adiabat			
e 0,9 Cavity I Hohlraum			0,900

Material	λ[W/(m·K)]	ε
Aluminum I Aluminium 10456	160,000	0,900
Artificial stone I Kunststein 10456	1,300	0,900
Compacfoam 100	0,040	0,900
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
ENERcell	0,060	0,900
EPDM	0,250	0,900
EPDM foam | Moosgummi	0,050	0,900
Glue I Klebestoff	0,310	0,900
Hartgummi (Ebonit), hart	0,170	0,900
Insulation I Wärmedämmung 040	0,040	0,900
Insulation I Wärmedämmung 045	0,045	0,900
Insulation Wärmedämmung 032	0,032	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900
PE-Insulation I Wärmedämmung 035	0,035	0,900
PU in-situ foam I PU-Ortschaum 040	0,040	0,900
Panel I Maske	0,035	0,900
Spruce, Fir I Fichte, Tanne	0,110	0,900
Steel I Stahl	50,000	0,900
Unvent. cavity I unbel. Hohlr. *		
slightly vent. cav. I leicht bel. Hohlr. *		

* EN ISO 10077-2:2017, 6.4.3







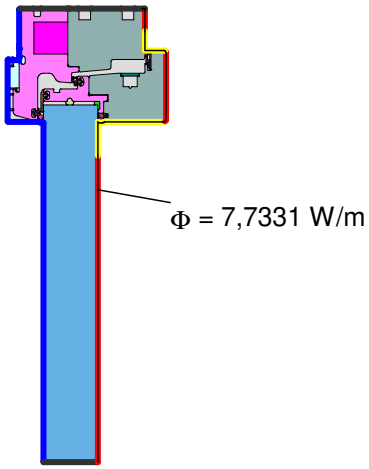
$$\Psi_{A\text{-}E\text{-}C,*} = \frac{\Phi}{\Delta T} - \frac{\Phi_1}{\Delta T} - U_2 \cdot b_2 = \frac{11{,}140}{30{,}000} - \frac{7{,}733}{30{,}000} - 0{,}115 \cdot 1{,}006 = -0{,}003 \text{ W/(m·K)}$$

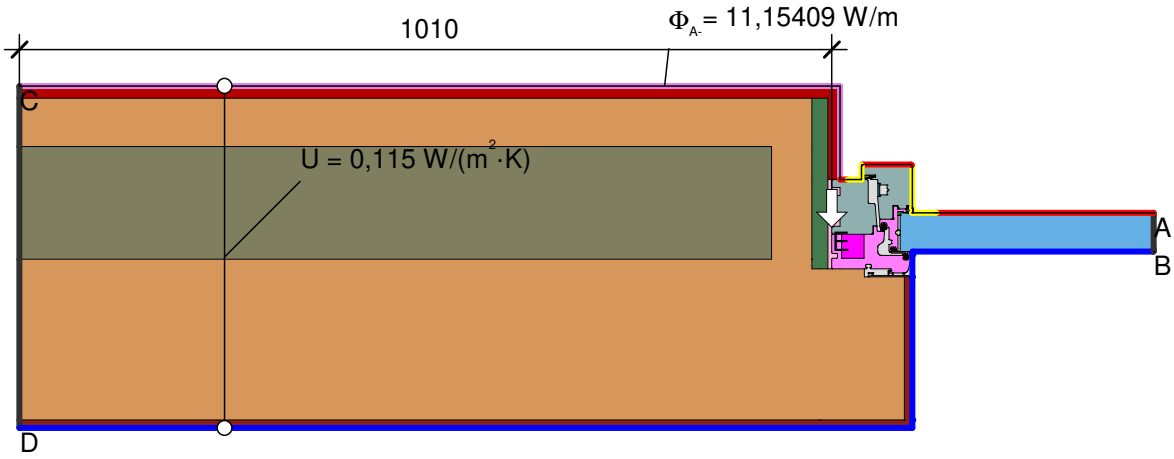
Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat			
Exterior | Außen	-10,000	0,040	
Interior | Innen	20,000	0,130	
Interior, frame, normal	20,000	0,130	
Interior, frame, reduced	20,000	0,200	
e 0,9 Cavity I Hohlraum			0,900

Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Exterior | Außen	-10,000	0,040	
fRsi: Interior | Innen	20,000	0,250	
Adiabatic | Adiabat			
e 0,9 Cavity I Hohlraum			0,900

Material	λ[W/(m·K)]	ε
Aluminum I Aluminium 10456	160,000	0,900
Compacfoam 100	0,040	0,900
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
ENERcell	0,060	0,900
EPDM	0,250	0,900
EPDM foam | Moosgummi	0,050	0,900
Glue I Klebestoff	0,310	0,900
Insulation Wärmedämmung 032	0,032	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900
PE-Insulation I Wärmedämmung 035	0,035	0,900
PU in-situ foam I PU-Ortschaum 040	0,040	0,900
Panel I Maske	0,035	0,900
Spruce, Fir I Fichte, Tanne	0,110	0,900
Steel I Stahl	50,000	0,900
Unvent. cavity I unbel. Hohlr. *		
slightly vent. cav. I leicht bel. Hohlr. *		

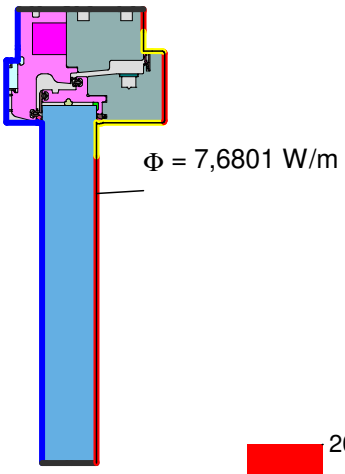
* EN ISO 10077-2:2017, 6.4.3





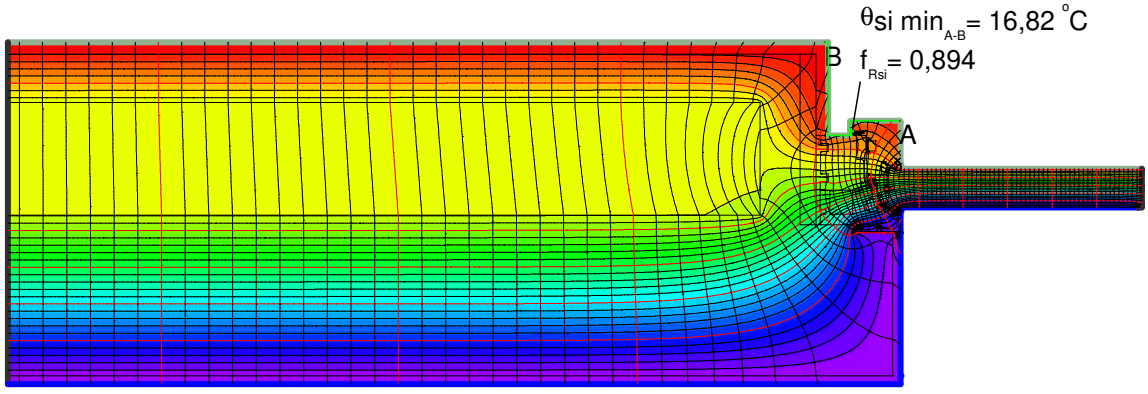
$$\psi_{A\text{-}E\text{-}C,\,*} = \frac{\Phi}{\Delta T} - \frac{\Phi_1}{\Delta T} - U_2 \cdot b_2 = \frac{11{,}154}{30{,}000} - \frac{7{,}680}{30{,}000} - 0{,}115 \cdot 1{,}010 = -0{,}001 \text{ W/(m·K)}$$

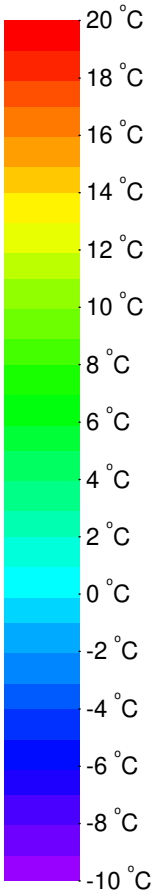
Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Exterior | Außen	-10,000	0,040	
Interior | Innen	20,000	0,130	
Interior, frame, normal	20,000	0,130	
Interior, frame, reduced	20,000	0,200	
Adiabatic | Adiabat			
e 0,9 Cavity I Hohlraum			0,900



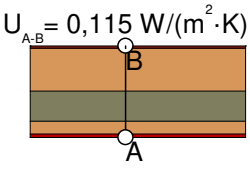
Material	λ[W/(m·K)]	ε
Aluminum I Aluminium 10456	160,000	0,900
Compacfoam 100	0,040	0,900
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300	0,900
ENERcell	0,060	0,900
EPDM	0,250	0,900
EPDM foam | Moosgummi (1)	0,050	0,900
Glue I Klebestoff	0,310	0,900
Insulation Wärmedämmung 032	0,032	0,900
Interior plaster I Gipsputz 10456	0,570	0,900
Joma EPS 030 grau	0,031	0,900
Organic compound plaster I Kunstharzputz 4108-4	0,700	0,900
PE-Insulation I Wärmedämmung 035	0,035	0,900
PU in-situ foam I PU-Ortschaum 040	0,040	0,900
Panel I Maske	0,035	0,900
Spruce, Fir I Fichte, Tanne	0,110	0,900
Steel I Stahl	50,000	0,900
Unvent. cavity I unbel. Hohlr. *		
slightly vent. cav. I leicht bel. Hohlr. *		

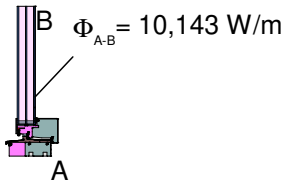
* EN ISO 10077-2:2017, 6.4.3

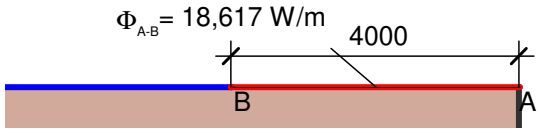




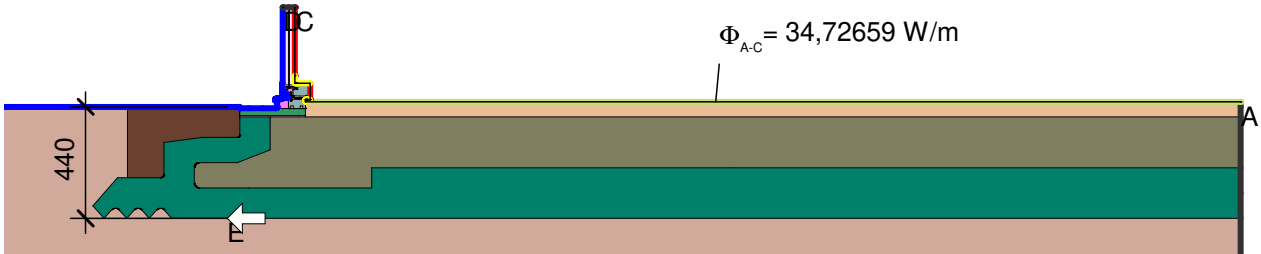
Boundary Condition	θ[°C]	R[(m²·K)/W]	ε
Exterior | Außen	-10,000	0,040	
fRsi: Interior | Innen	20,000	0,250	
Adiabatic | Adiabat			
e 0,9 Cavity I Hohlraum			0,900







Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε
Adiabatic | Adiabat	0,000			
EQ FS: 1/Ufs		20,000	4,744	
Exterior | Außen		-10,000	0,040	



$$\Psi_{A\text{-}E\text{-}C,*} = \frac{\Phi}{\Delta T} - \frac{\Phi_1}{\Delta T} - U_2 \cdot b_2 - \frac{\Phi_3}{\Delta T} = \frac{34{,}727}{30{,}000} - \frac{18{,}617}{30{,}000} - 0{,}115 \cdot 0{,}440 - \frac{10{,}143}{30{,}000} = 0{,}148 \text{ W/(m·K)}$$

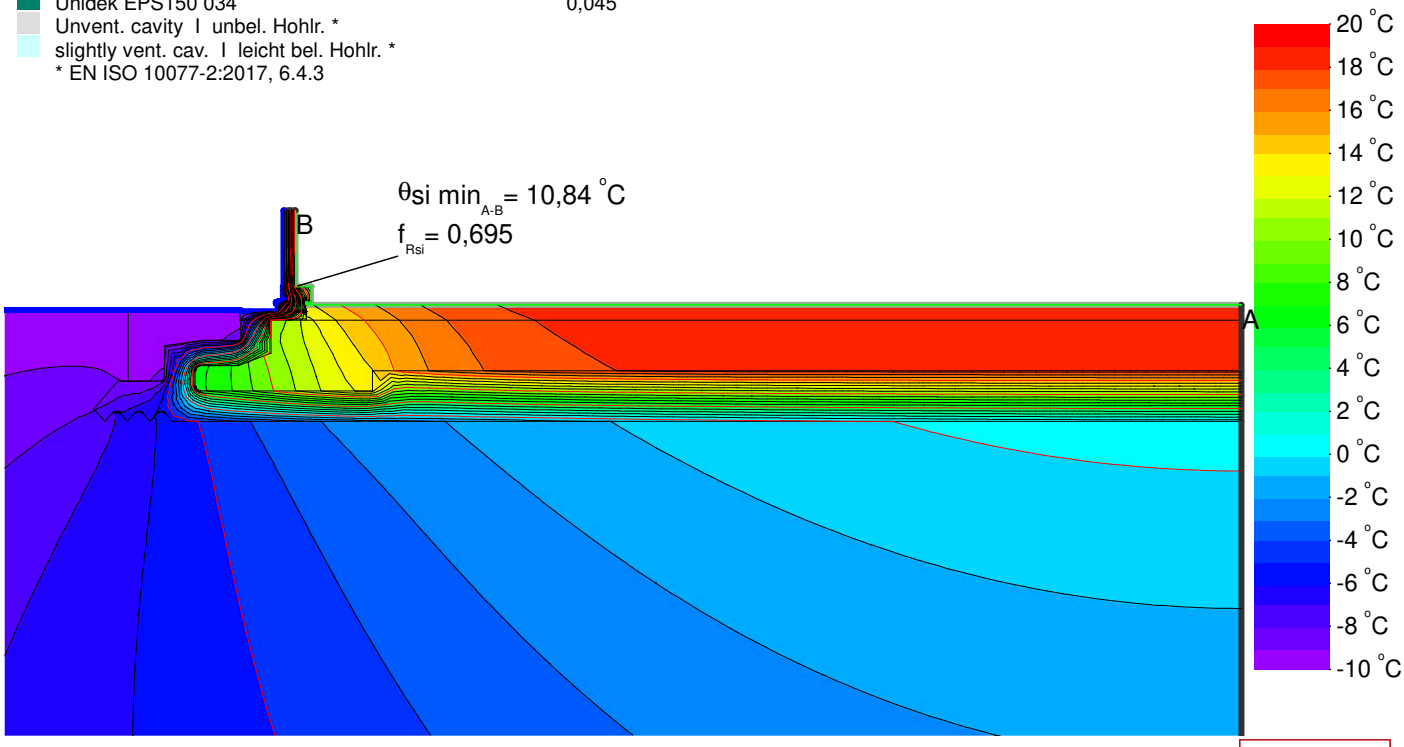
$$\Psi_{FS1\_OT1} = \Psi_{FS1\_EW1+OT1} - \Psi_{FS1\_EW1} = -0{,}148 - 0{,}006 = 0{,}142 \text{ W/(mK)}$$

Material	λ[W/(m·K)]
Aluminum I Aluminium 10456	160,000
Ar18 in 48 mm U 0,7	0,029
Cement screed I Zement-Estrich 4108	1,400
Compacfoam 100	0,040
Concrete, 1% Steel I Beton, 1% Stahl 10456	2,300
ENERcell	0,060
EPDM	0,250
EPDM foam | Moosgummi	0,050
Erdreich Sand und Kies	2,000
Glass I Glas (1)	1,000
Glue I Klebestoff	0,310
Ground I Erdreich	2,000
Mörtel, Zement, Sand	1,000
PE-Insulation I Wärmedämmung 035	0,035
PU in-situ foam I PU-Ortschaum 040	0,040
PU-Seal I PU Dichtung	0,250
Polyamide 25% Glassfiber (1)	0,300
SWISSP. Ultimate Box 2	0,140
Silicone I Silikon	0,350
Spruce, Fir I Fichte, Tanne	0,110
Unidek EPS150 034	0,045
Unvent. cavity I unbel. Hohlr. *	
slightly vent. cav. I leicht bel. Hohlr. *	

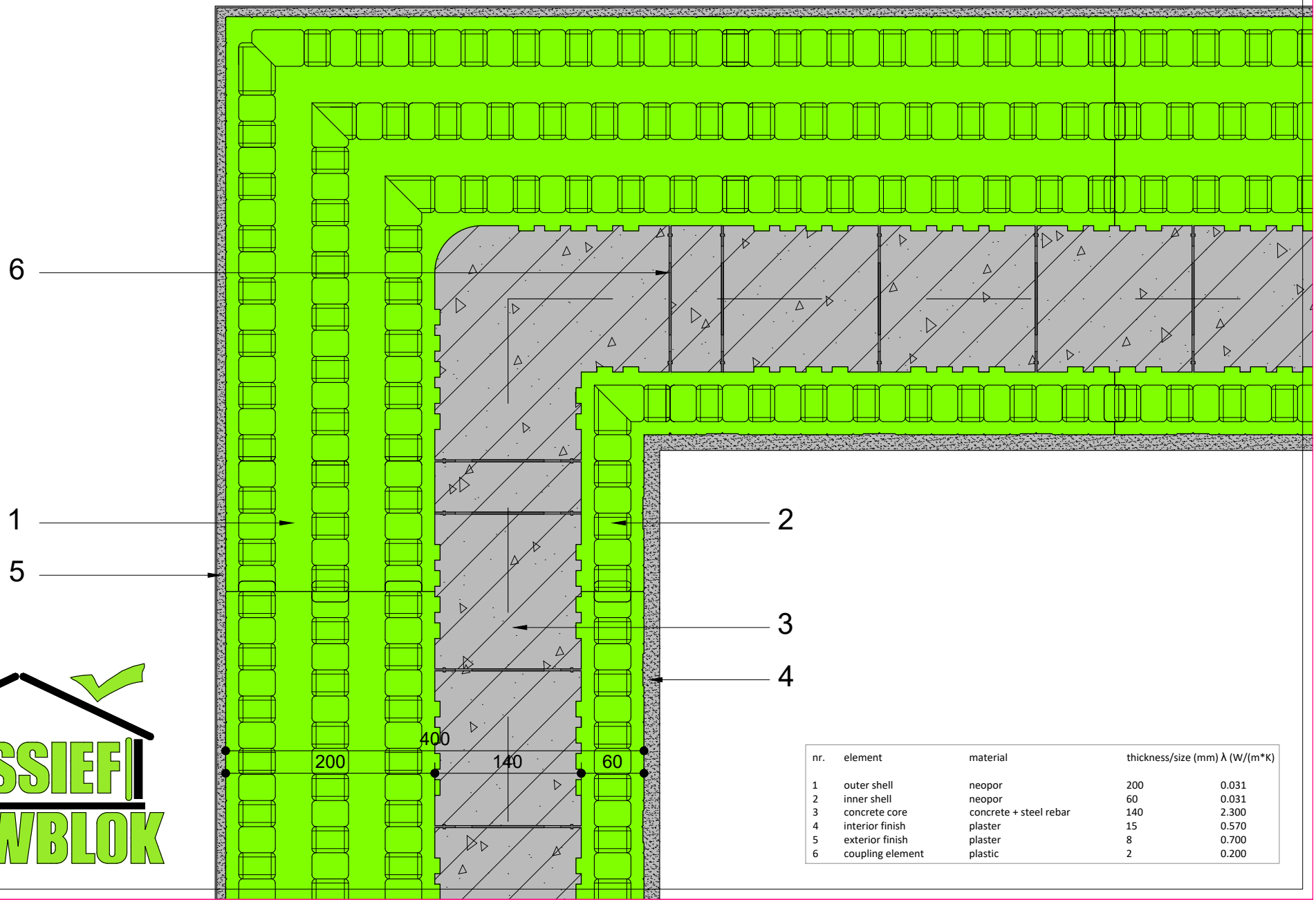
* EN ISO 10077-2:2017, 6.4.3

Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]
Adiabatic | Adiabat	0,000		
Exterior | Außen		-10,000	0,040
Int. flux down I Innen abwärts		20,000	0,170
Interior, frame, normal		20,000	0,130
Interior, frame, reduced		20,000	0,200

Boundary Condition	q[W/m²]	θ[°C]	R[(m²·K)/W]	ε	φ[%]
Exterior | Außen		-10,000	0,040		
fRsi: Interior I Innen		20,000	0,250		
Adiabatic | Adiabat	0,000				
e 0,9 Cavity I Hohlraum				0,900	



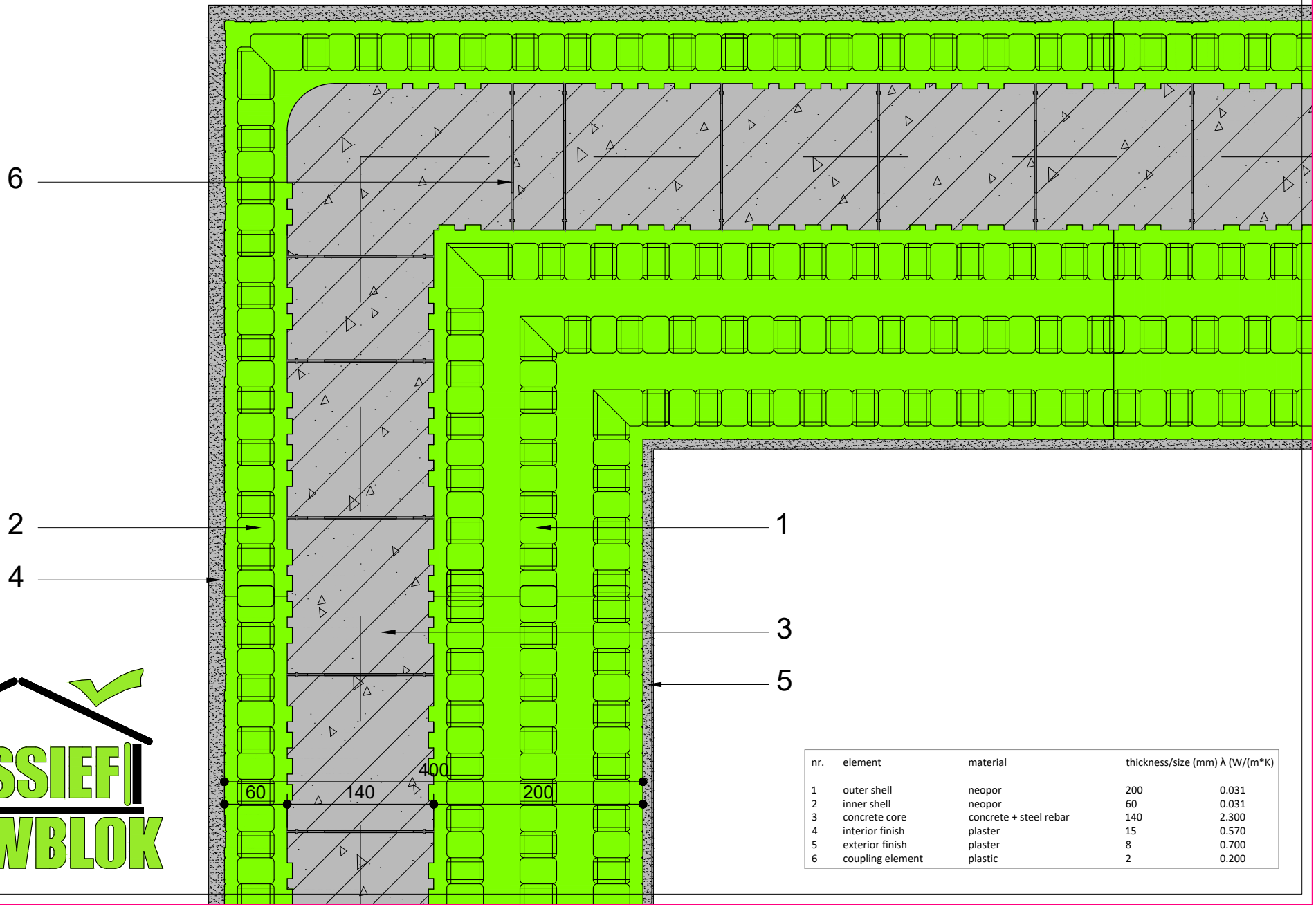
DETAIL 1: EW1_EW1_ec1



nr.	element	material	thickness/size (mm)	λ (W/(m*K)
1	outer shell	neopor	200	0.031
2	inner shell	neopor	60	0.031
3	concrete core	concrete + steel rebar	140	2.300
4	interior finish	plaster	15	0.570
5	exterior finish	plaster	8	0.700
6	coupling element	plastic	2	0.200

PASSIEF BOUWBLOK

DETAIL 2: EW1_EW1_ic1

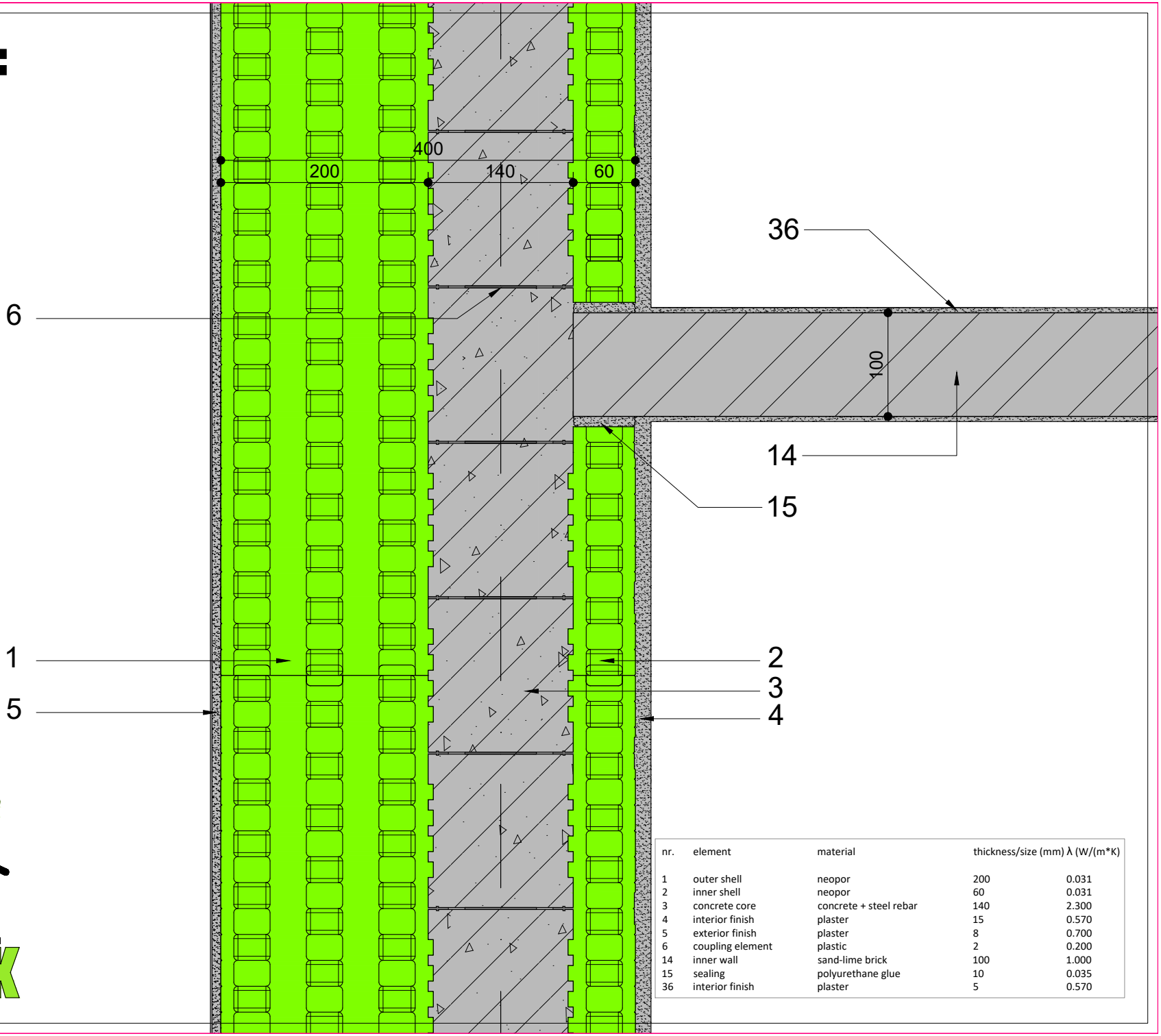


nr.	element	material	thickness/size (mm)	λ (W/(m*K)
1	outer shell	neopor	200	0.031
2	inner shell	neopor	60	0.031
3	concrete core	concrete + steel rebar	140	2.300
4	interior finish	plaster	15	0.570
5	exterior finish	plaster	8	0.700
6	coupling element	plastic	2	0.200

PASSIEF BOUWBLOK

DETAIL 3:

EW1_IW1



nr.	element	material	thickness/size (mm)	λ (W/(m*K)
1	outer shell	neopor	200	0.031
2	inner shell	neopor	60	0.031
3	concrete core	concrete + steel rebar	140	2.300
4	interior finish	plaster	15	0.570
5	exterior finish	plaster	8	0.700
6	coupling element	plastic	2	0.200
14	inner wall	sand-lime brick	100	1.000
15	sealing	polyurethane glue	10	0.035
36	interior finish	plaster	5	0.570

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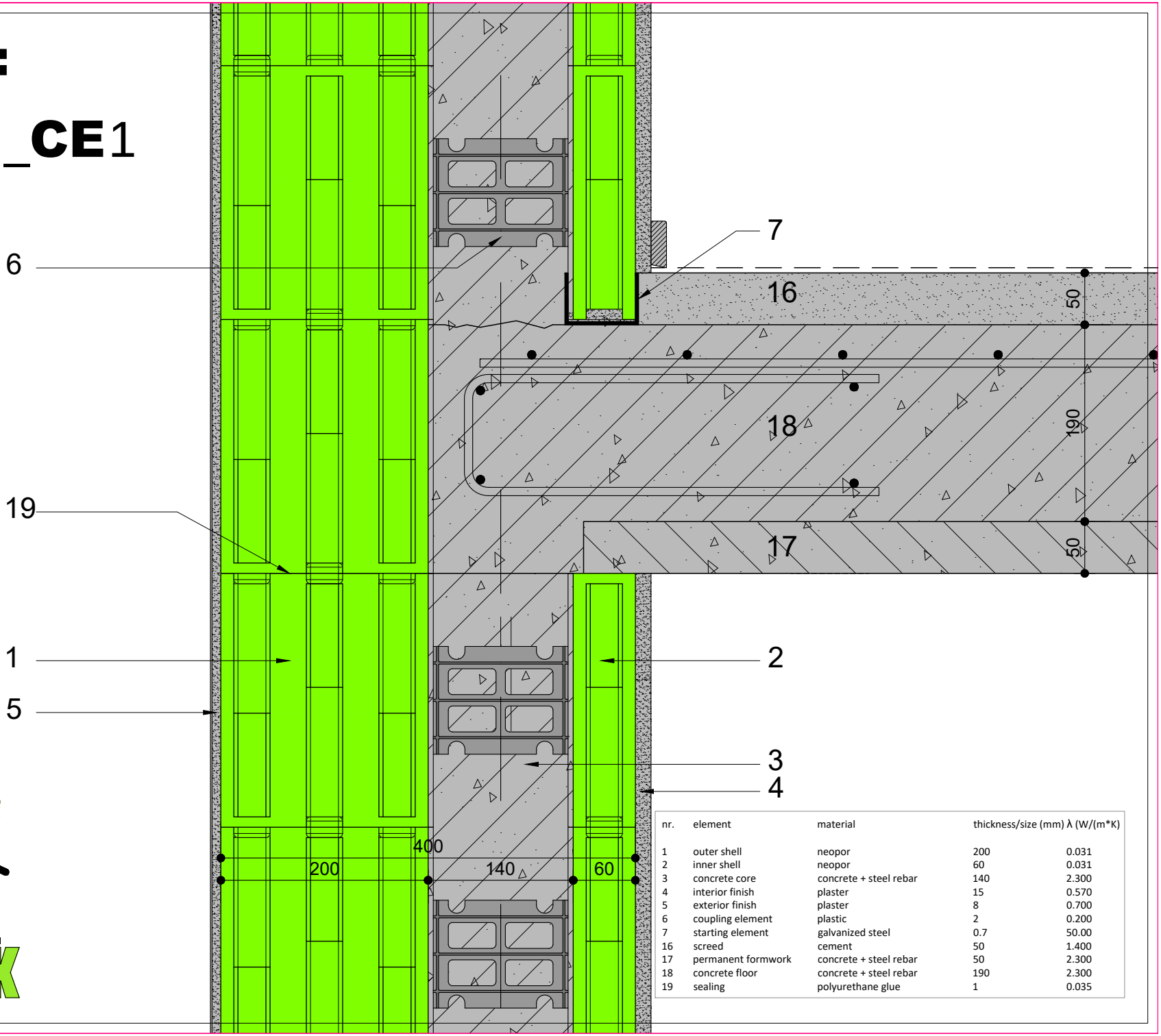
DETAIL 4:

EW1_WE1_CE1



nr.	element	material	thickness/size (mm)	λ (W/(m*K)
1	outer shell	neopor	200	0.031
2	inner shell	neopor	60	0.031
3	concrete core	concrete + steel rebar	140	2.300
4	interior finish	plaster	15	0.570
5	exterior finish	plaster	8	0.700
6	coupling element	plastic	2	0.200
7	starting element	galvanized steel	0.7	50.00
16	screed	cement	50	1.400
17	permanent formwork	concrete + steel rebar	50	2.300
18	concrete floor	concrete + steel rebar	190	2.300
19	sealing	polyurethane glue	1	0.035

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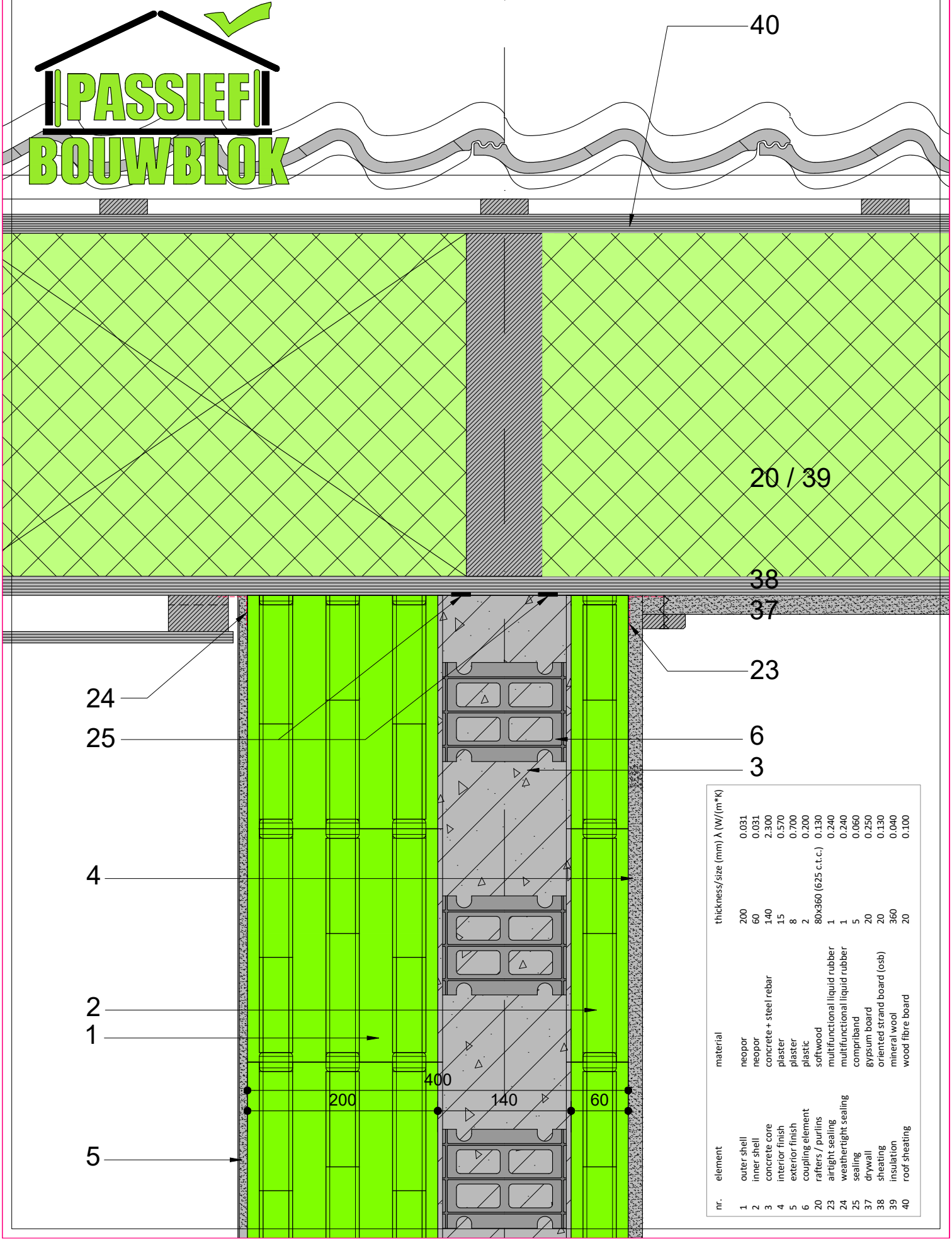
DETAIL 5: EW1_RO1_ve1



nr.	element	material	thickness/size (mm)	λ (W/(m*K)
1	outer shell	neopor	200	0.031
2	inner shell	neopor	60	0.031
3	concrete core	concrete + steel rebar	140	2.300
4	interior finish	plaster	15	0.570
5	exterior finish	plaster	8	0.700
6	coupling element	plastic	2	0.200
20	rafters / purlins	softwood	80x360 (625 c.t.c.)	0.130
23	airtight sealing	multifunctional liquid rubber	1	0.240
24	weathertight sealing	multifunctional liquid rubber	1	0.240
25	sealing	compriband	5	0.060
37	drywall	gypsum board	20	0.250
38	sheating	oriented strand board (osb)	20	0.130
39	insulation	mineral wool	360	0.040
40	roof sheating	wood fibre board	20	0.100

DETAIL 6: EW1_RO1_ea1

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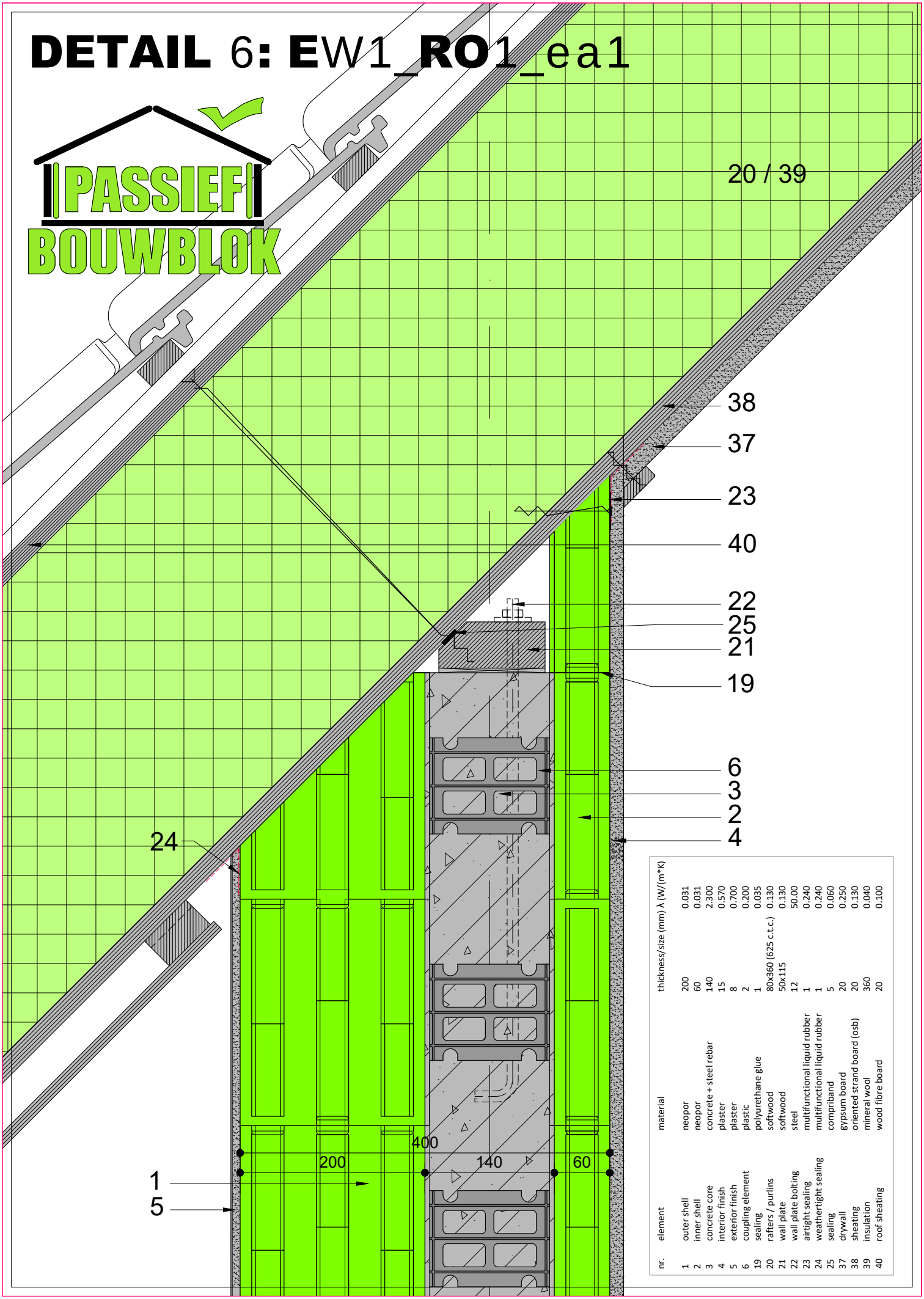
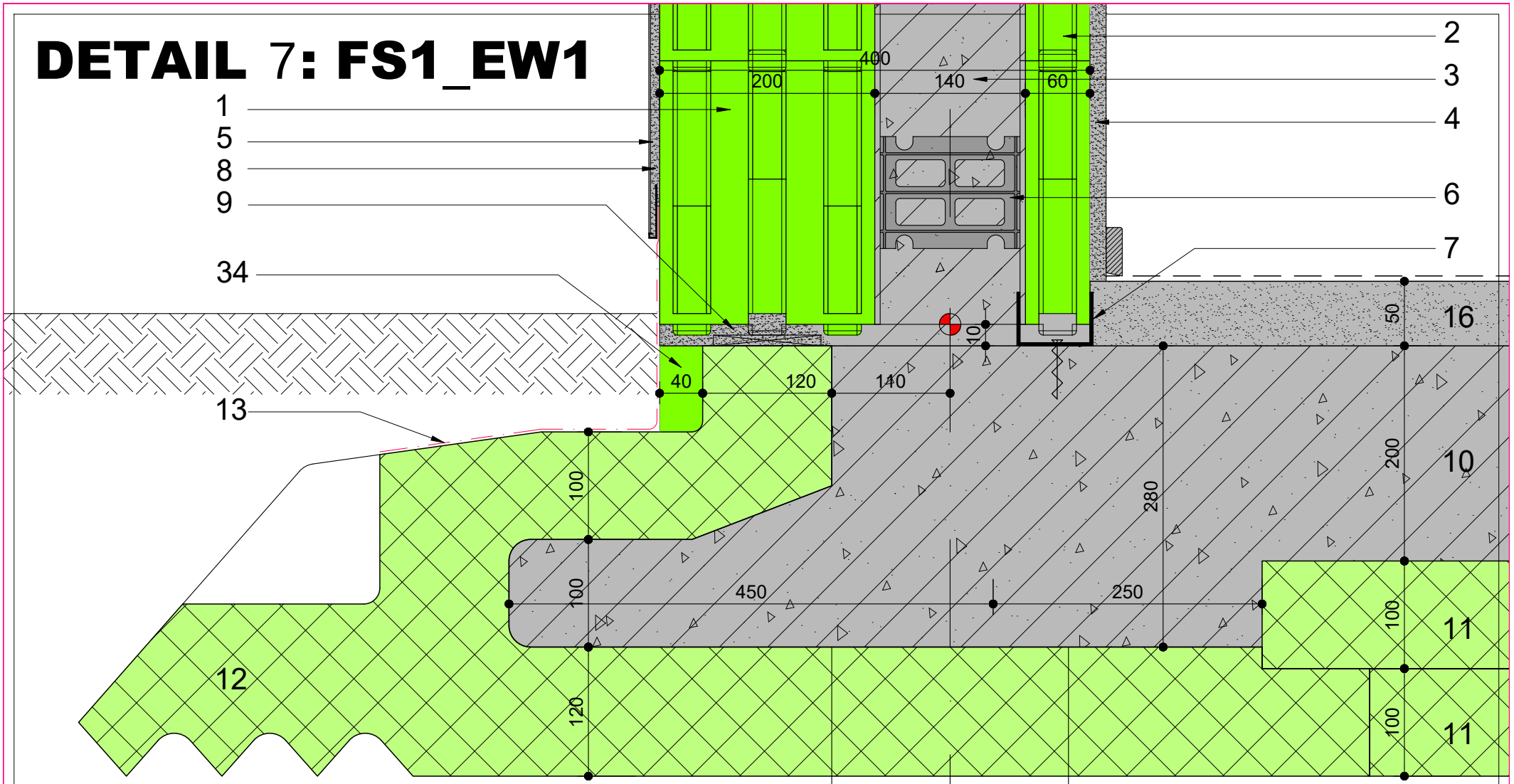


nr.	element	material	thickness/size (mm)	λ (W/(m*K)
1	outer shell	neopor	200	0.031
2	inner shell	neopor	60	0.031
3	concrete core	concrete + steel rebar	140	2.300
4	interior finish	plaster	15	0.570
5	exterior finish	plaster	8	0.700
6	coupling element	plastic	2	0.200
19	sealing	polyurethane glue	1	0.035
20	rafters / purlins	softwood	80x360 (625 c.t.c.)	0.130
21	wall plate	softwood	50x115	0.130
22	wall plate bolting	steel	12	50.00
23	airtight sealing	multifunctional liquid rubber	1	0.240
24	weathertight sealing	multifunctional liquid rubber	1	0.240
25	sealing	compriband	5	0.060
37	drywall	gypsum board	20	0.250
38	sheating	oriented strand board (osb)	20	0.130
39	insulation	mineral wool	360	0.040
40	roof sheating	wood fibre board	20	0.100

DETAIL 7: FS1_EW1



nr.	element	material	thickness/size (mm)	λ (W/(m*K)
1	outer shell	neopor	200	0.031
2	inner shell	neopor	60	0.031
3	concrete core	concrete + steel rebar	140	2.300
4	interior finish	plaster	15	0.570
5	exterior finish	plaster	8	0.700
6	coupling element	plastic	2	0.200
7	starting element	galvanized steel	0.7	50.00
8	plaster stop profile	aluminium	0.7	160.0
9	sealing	polyurethane foam	10	0.040
10	concrete floor	concrete + steel rebar	200	2.300
11	floor insulation	expanded polystyrene (eps)	100	0.045
12	foundation formwork	expanded polystyrene (eps)	100 to 120	0.045
13	coating	multifunctional liquid rubber	1	0.240
16	screed	cement	50	1.400
34	filler piece	neopor	40	0.031

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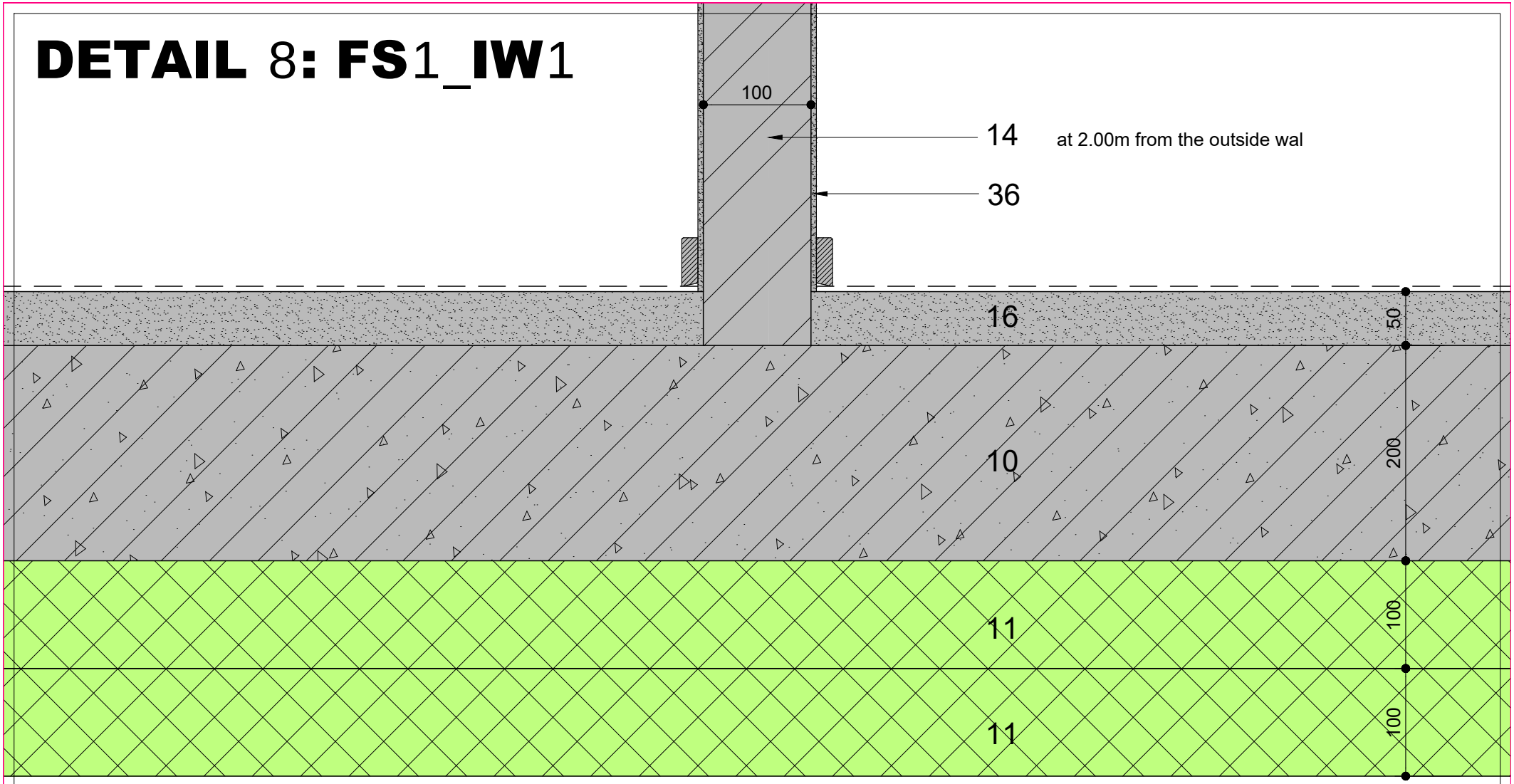
DETAIL 8: FS1_IW1



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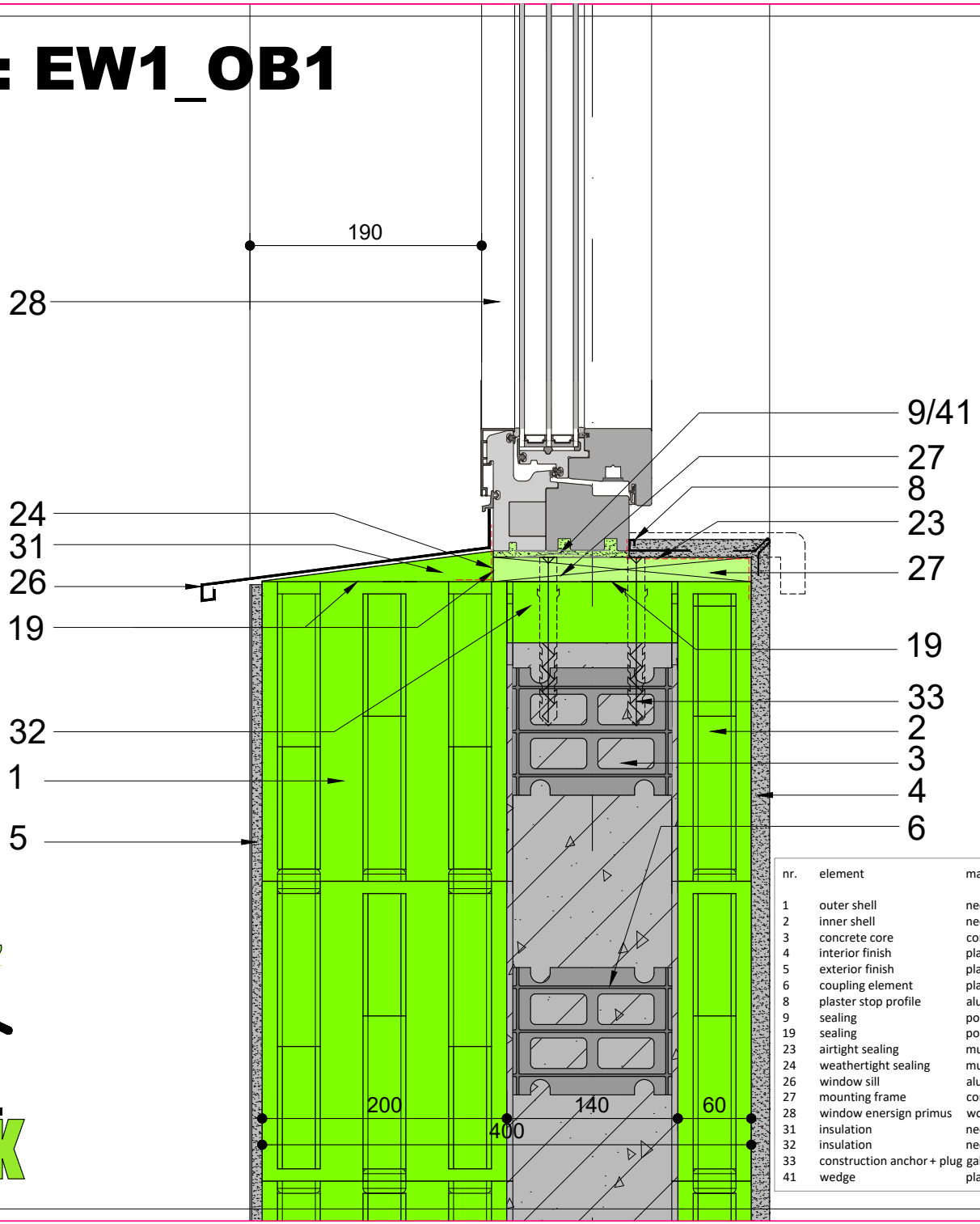
nr.	element	material	thickness/size (mm)	λ (W/(m*K)
10	concrete floor	concrete + steel rebar	200	2.300
11	floor insulation	expanded polystyrene (eps)	100	0.045
14	inner wall	sand-lime brick	100	1.000
16	screed	cement	50	1.400
36	interior finish	plaster	5	0.570

DETAIL 9: EW1_OB1



nr.	element	material	thickness/size (mm)	λ (W/(m*K)
1	outer shell	neopor	200	0.031
2	inner shell	neopor	60	0.031
3	concrete core	concrete + steel rebar	140	2.300
4	interior finish	plaster	15	0.570
5	exterior finish	plaster	8	0.700
6	coupling element	plastic	2	0.200
8	plaster stop profile	aluminium	0.7	160.0
9	sealing	polyurethane foam	5 to 8	0.040
19	sealing	polyurethane glue	1	0.035
23	airtight sealing	multifunctional liquid rubber	1	0.240
24	weathertight sealing	multifunctional liquid rubber	1	0.240
26	window sill	aluminium	1.5	160.0
27	mounting frame	compacfoam	20x210	0.040
28	window enersign primus	wood + aluminium		
31	insulation	neopor	190	0.031
32	insulation	neopor	50x140	0.031
33	construction anchor + plug	galvanized steel + nylon	6x140 (400 c.t.c.)	50.00
41	wedge	plastic	5x20x60	0.200

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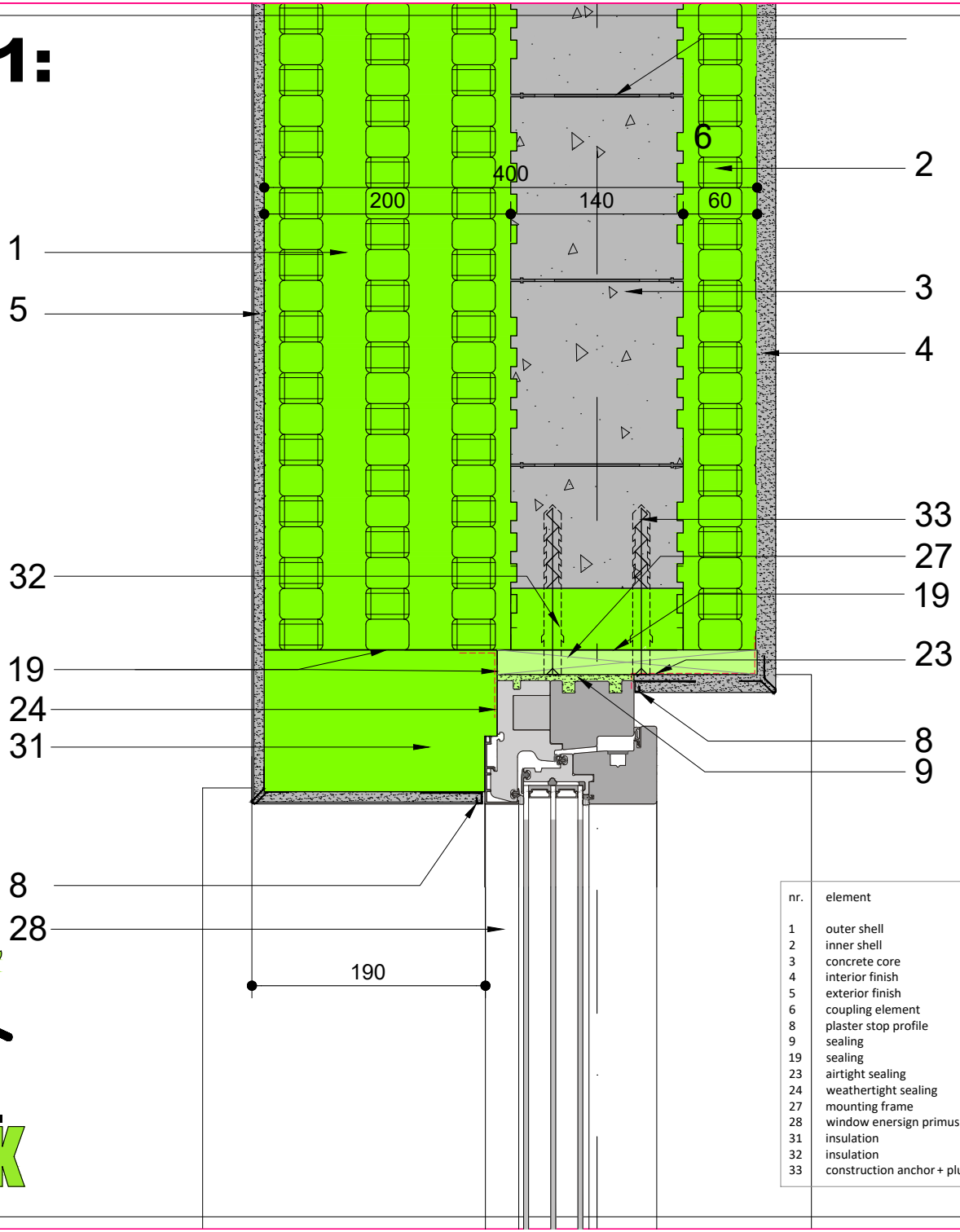
DETAIL 11:

EW1_OH1



nr.	element	material	thickness/size (mm)	λ (W/(m*K)
1	outer shell	neopor	200	0.031
2	inner shell	neopor	60	0.031
3	concrete core	concrete + steel rebar	140	2.300
4	interior finish	plaster	15	0.570
5	exterior finish	plaster	8	0.700
6	coupling element	plastic	2	0.200
8	plaster stop profile	aluminium	0.7	160.0
9	sealing	polyurethane foam	5 to 8	0.040
19	sealing	polyurethane glue	1	0.035
23	airtight sealing	multifunctional liquid rubber	1	0.240
24	weathertight sealing	multifunctional liquid rubber	1	0.240
27	mounting frame	compacfoam	20x210	0.040
28	window enersign primus	wood + aluminium		
31	insulation	neopor	190	0.031
32	insulation	neopor	50x140	0.031
33	construction anchor + plug	galvanized steel + nylon	6x140 (400 c.t.c.)	50.00

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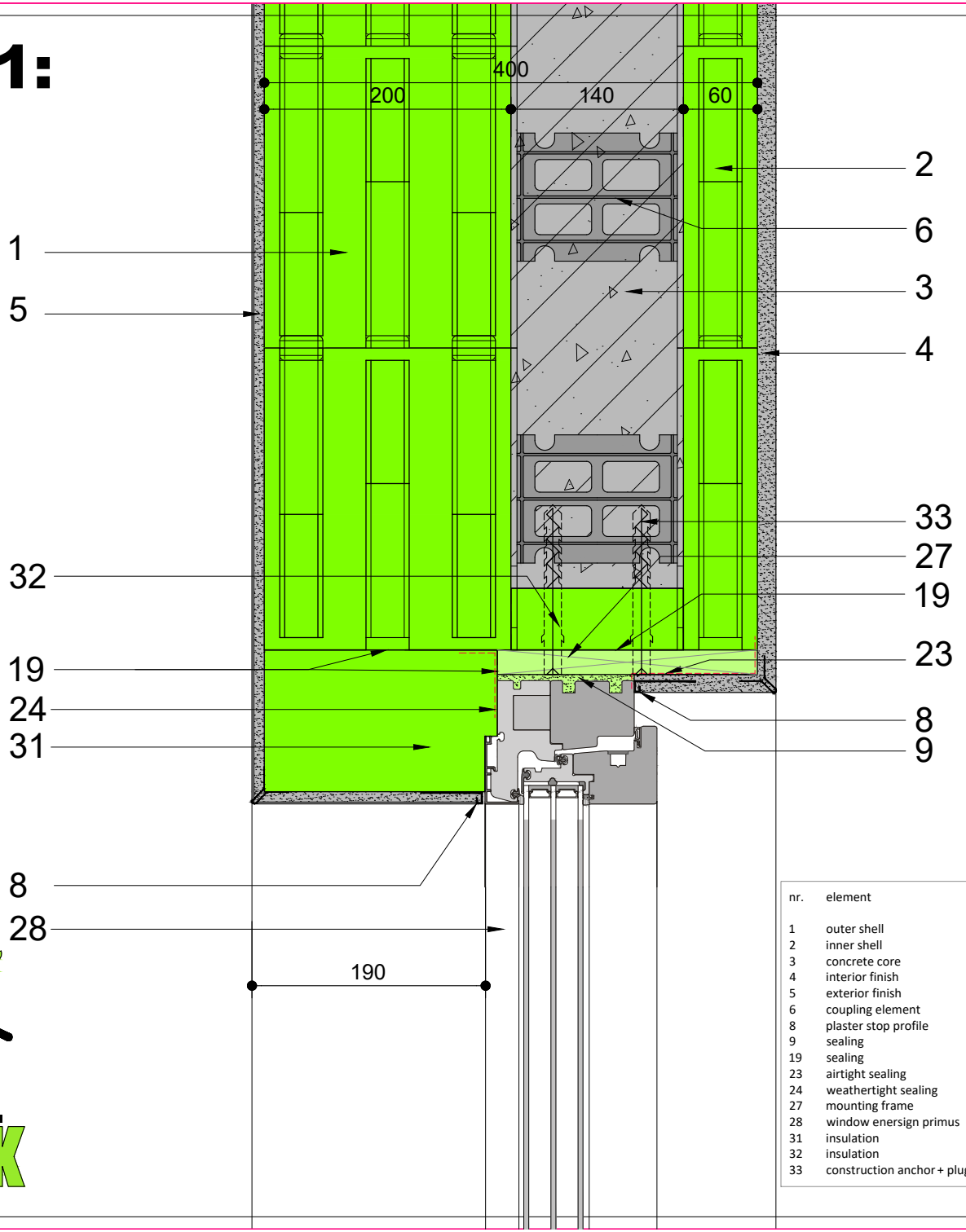
DETAIL 11:

EW1_OJ1



nr.	element	material	thickness/size (mm)	λ (W/(m*K)
1	outer shell	neopor	200	0.031
2	inner shell	neopor	60	0.031
3	concrete core	concrete + steel rebar	140	2.300
4	interior finish	plaster	15	0.570
5	exterior finish	plaster	8	0.700
6	coupling element	plastic	2	0.200
8	plaster stop profile	aluminium	0.7	160.0
9	sealing	polyurethane foam	5 to 8	0.040
19	sealing	polyurethane glue	1	0.035
23	airtight sealing	multifunctional liquid rubber	1	0.240
24	weathertight sealing	multifunctional liquid rubber	1	0.240
27	mounting frame	compacfoam	20x210	0.040
28	window enersign primus	wood + aluminium		
31	insulation	neopor	190	0.031
32	insulation	neopor	50x140	0.031
33	construction anchor + plug	galvanized steel + nylon	6x140 (400 c.t.c.)	50.00

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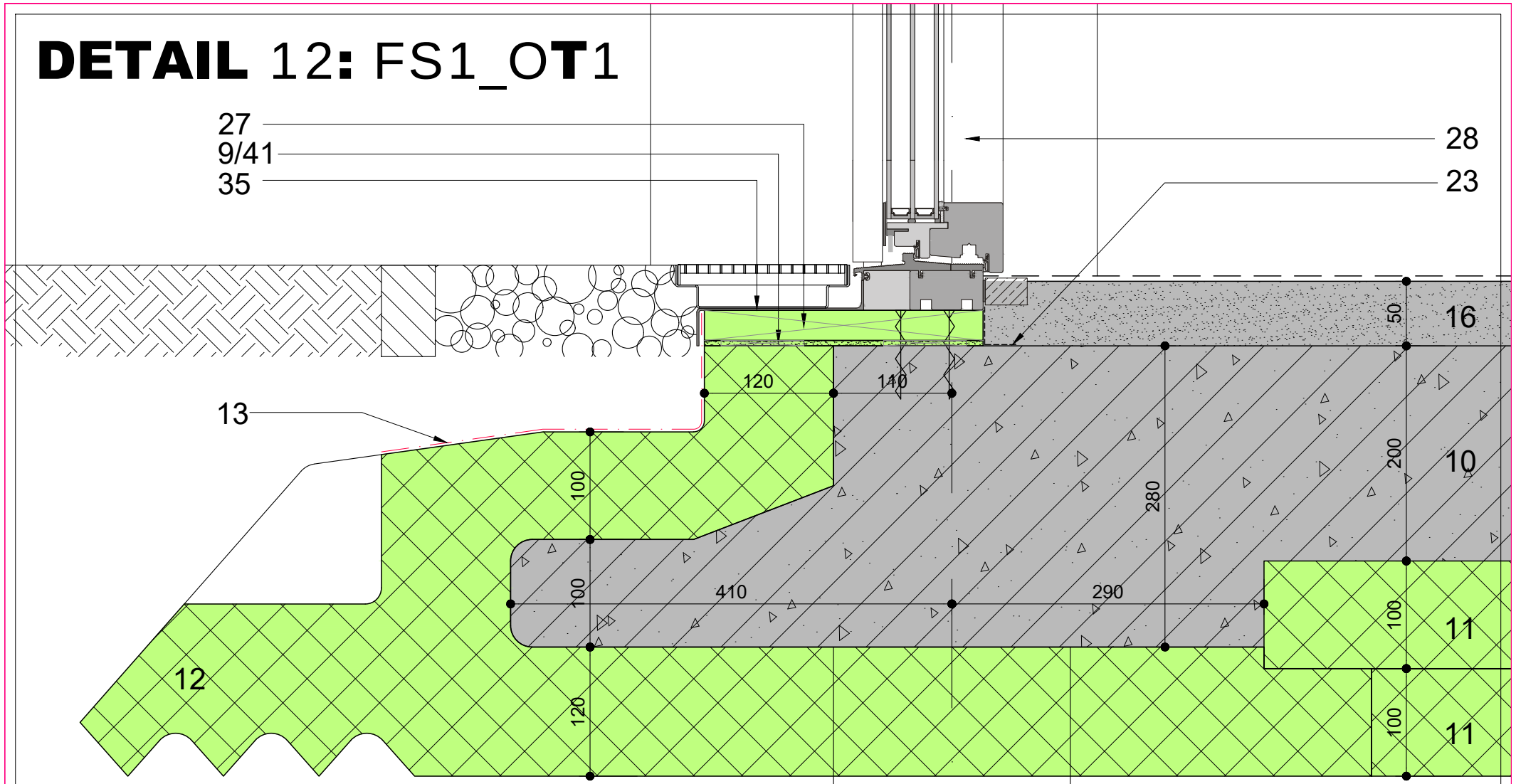
DETAIL 12: FS1_OT1



nr.	element	material	thickness/size (mm)	λ (W/(m*K)
9	sealing	polyurethane foam	5 tot 8	0.040
10	concrete floor	concrete + steel rebar	200	2.300
11	floor insulation	expanded polystyrene (eps)	100	0.045
12	foundation formwork	expanded polystyrene (eps)	100 to 120	0.045
13	coating	multifunctional liquid rubber	1	0.240
16	screed	cement	50	1.400
23	airtight sealing	multifunctional liquid rubber	1	0.240
27	mounting frame	compacfoam	30x260	0.040
28	window enersign primus	wood + aluminium		
35	door sill	steel	1.5	50.00
41	wedge	plastic	5x20x60	0.200

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