Steco Centar d.o.o.
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Steco STANDARD Plus External wall Final

Exterior wall
created on 23.1.2018

Thermal protection

U = 0,114 W/(m²K)

EnEV Bestand*: U<0,24 W/(m²K)

excellent — insufficient

Moisture proofing

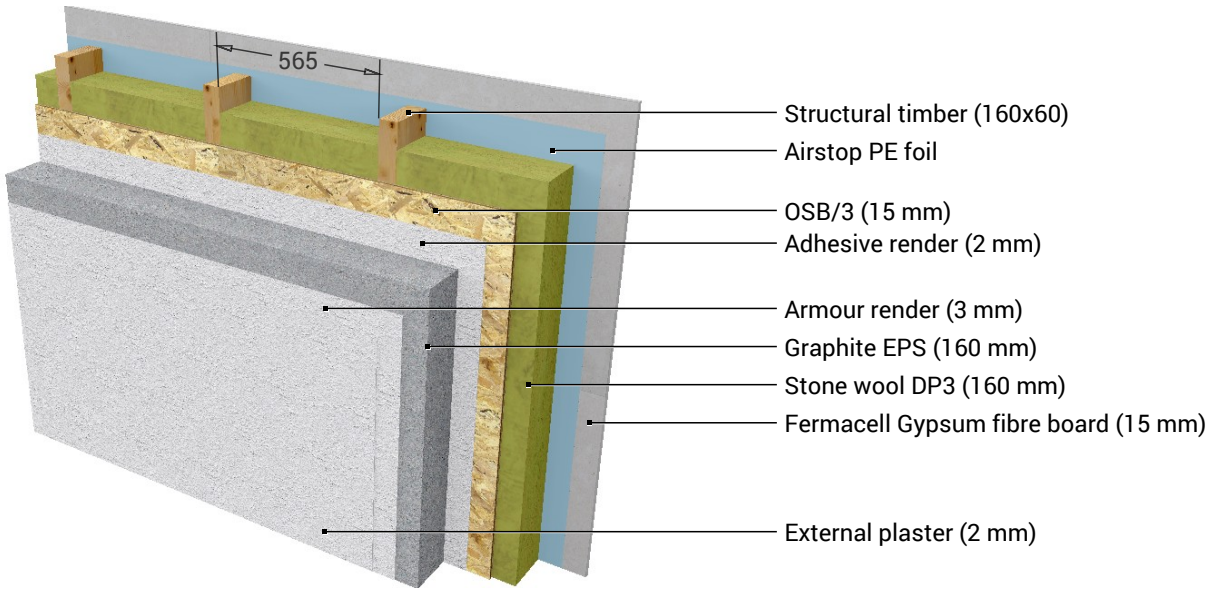
Drying reserve: 165 g/m²a
No condensate

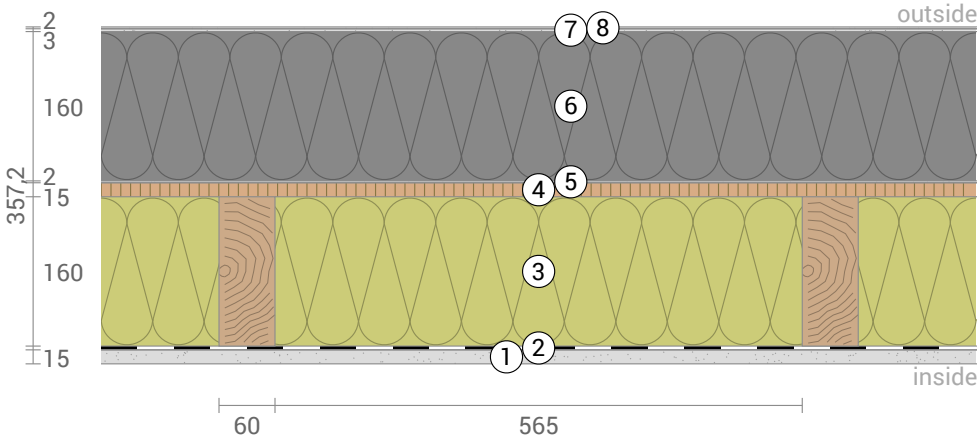
excellent — insufficient

Heat protection

Temperature amplitude damping: 51
phase shift: 11,8 h
Thermal capacity inside: 43 kJ/m²K

excellent — insufficient





1. Fermacell Gypsum fibre board (15 mm)
2. Airstop PE foil
3. Stone wool DP3 (160 mm)
4. OSB/3 (15 mm)
5. Adhesive render (2 mm)
6. Graphite EPS (160 mm)
7. Armour render (3 mm)
8. External plaster (2 mm)

Inside air :	20,0°C / 50%			Thickness:	35,7 cm
Outside air:	-5,0°C / 80%	sd-value:	113,2 m	Weight:	50 kg/m²
Surface temperature.:	18,9°C / -4,9°C	Drying reserve:	165 g/m²a	Heat capacity:	64 kJ/m²K

☑ EnEV Bestand ☑ EnEV16 Neubau ☑ EnEV14 Neubau ☑ EnEV Bestand (Nichtwohngeb.)

*Comparison of the U-value with den Höchstwerten aus EnEV 2014 Anlage 3 Tabelle 1 (EnEV Bestand); den Höchstwerten aus EnEV 2014 Anlage 3 Tabelle 1 (EnEV Bestand, niedrige InnenTemp.); 80% des U-Werts der Referenzausführung aus EnEV 2014 Anlage 1 Tabelle 1 (EnEV16 Neubau); der Referenzausführung aus EnEV 2014 Anlage 1 Tabelle 1 (EnEV14 Neubau)

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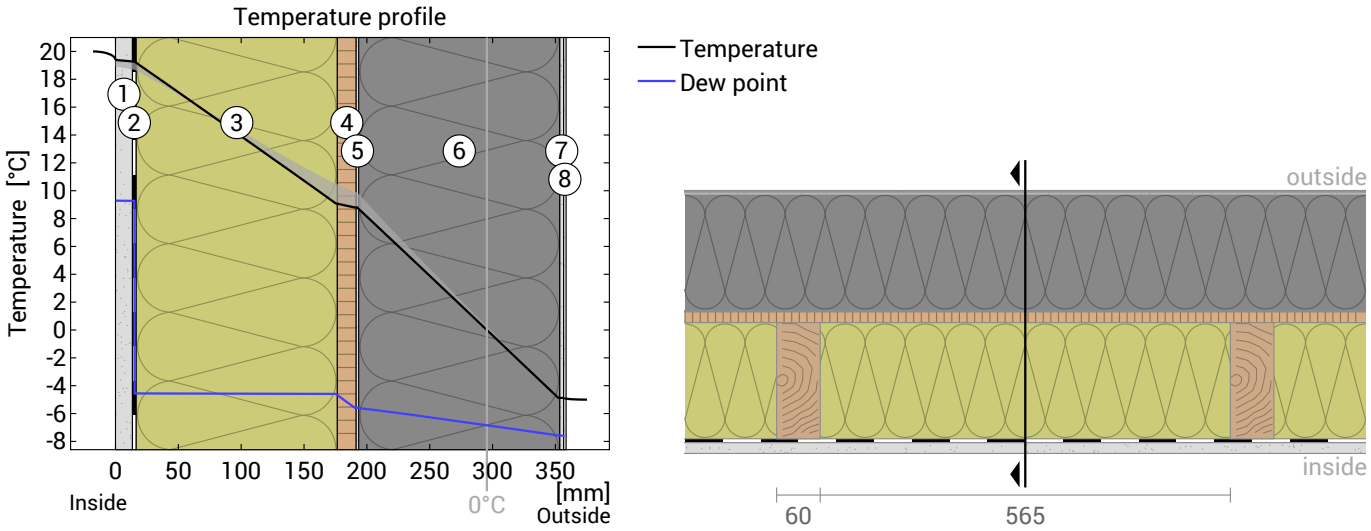
Steco STANDARD Plus External wall Final, U=0,11 W/(m²K)

Temperature profile



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② Airstop PE foil
③ Stone wool DP3 (160 mm)
④ OSB/3 (15 mm)
⑤ Adhesive render (2 mm)
⑥ Graphite EPS (160 mm)
⑦ Armour render (3 mm)
⑧ External plaster (2 mm)

Left: Temperature and dew-point temperature at the place marked in the right figure. The dew-point indicates the temperature, at which water vapour condensates. As long as the temperature of the component is everywhere above the dew point, no condensation occurs. If the curves have contact, condensation occurs at the corresponding position.
Right: The component, drawn to scale.

Layers (from inside to outside)

#		Material	λ [W/mK]	R [m²K/W]	Temperatur [°C] min	max	Weight [kg/m²]
		Thermal contact resistance*		0,130	18,9	20,0	
1	1,5 cm	Fermacell Gypsum fibre board	0,320	0,047	18,7	19,4	17,3
2	0,02 cm	Airstop PE foil	0,500	0,000	18,7	19,3	0,2
3	16 cm	Stone wool DP3	0,039	4,103	9,1	19,3	4,3
	16 cm	Structural timber (9,6%)	0,130	1,231	10,5	18,8	6,9
4	1,5 cm	OSB/3	0,130	0,115	8,8	10,5	9,3
5	0,2 cm	Adhesive render	1,000	0,002	8,8	9,9	3,0
6	16 cm	Graphite EPS	0,032	5,000	-4,9	9,9	2,4
7	0,3 cm	Armour render	1,000	0,003	-4,9	-4,9	4,5
8	0,2 cm	External plaster	0,540	0,004	-4,9	-4,9	2,8
		Thermal contact resistance*		0,040	-5,0	-4,9	
	35,72 cm	Whole component		8,787			50,7

*Thermal contact resistances according to DIN 6946 for the U-value calculation. Rsi=0,25 and Rse=0,04 according to DIN 4108-3 were used for moisture proofing and temperature profile.

Surface temperature inside (min / average / max):	18,9°C	19,3°C	19,4°C
Surface temperature outside (min / average / max):	-4,9°C	-4,9°C	-4,9°C

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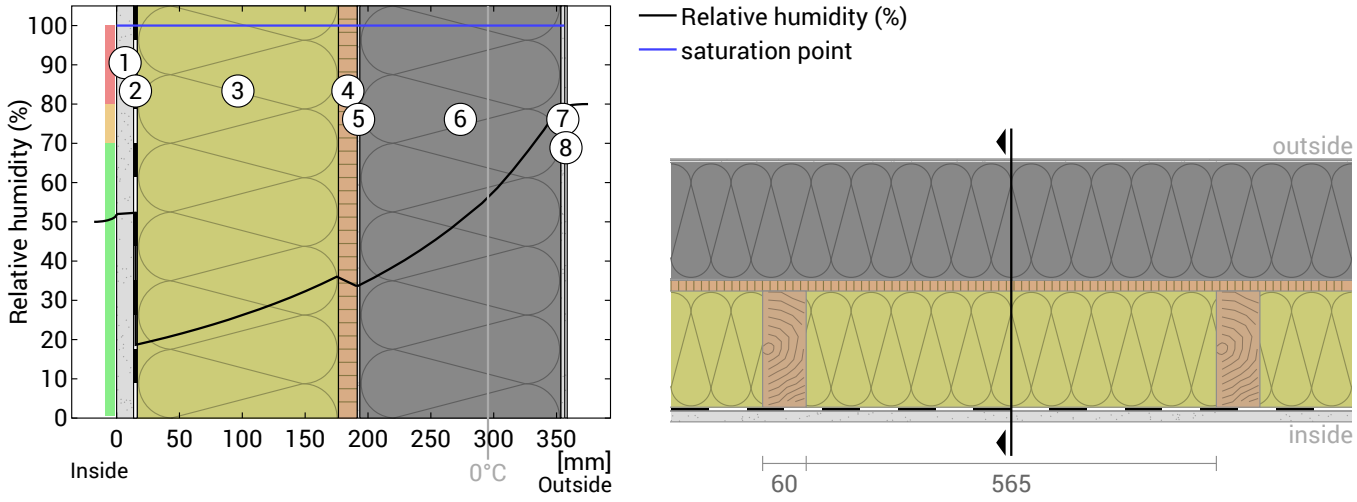
Moisture proofing

This component is free of condensate under the given climate conditions.
The drying reserve of this component is 165 g/(m²a). Required by DIN 68800-2: at least 100 g/(m²a).

#		Material	sd-value [m]	Condensate [kg/m²]	[Gew.-%]	Weight [kg/m²]
1	1,5 cm	Fermacell Gypsum fibre board	0,19	-		17,3
2	0,02 cm	Airstop PE foil	100,00	-		0,2
3	16 cm	Stone wool DP3	0,16	-		4,3
	16 cm	Structural timber (9,6%)	3,20	-	-	6,9
4	1,5 cm	OSB/3	4,50	-	-	9,3
5	0,2 cm	Adhesive render	0,04	-		3,0
6	16 cm	Graphite EPS	8,00	-		2,4
7	0,3 cm	Armour render	0,06	-		4,5
8	0,2 cm	External plaster	0,02	-		2,8
	35,72 cm	Whole component	113,20			50,7

Humidity

The temperature of the inside surface is 18,9 °C leading to a relative humidity on the surface of 54%.Mould formation is not expected under these conditions.
The following figure show the relative humidity inside the component.



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To calculate the diffusion currents a two-dimensional finite element method was used. More information on the section 'humidity' on the input form.

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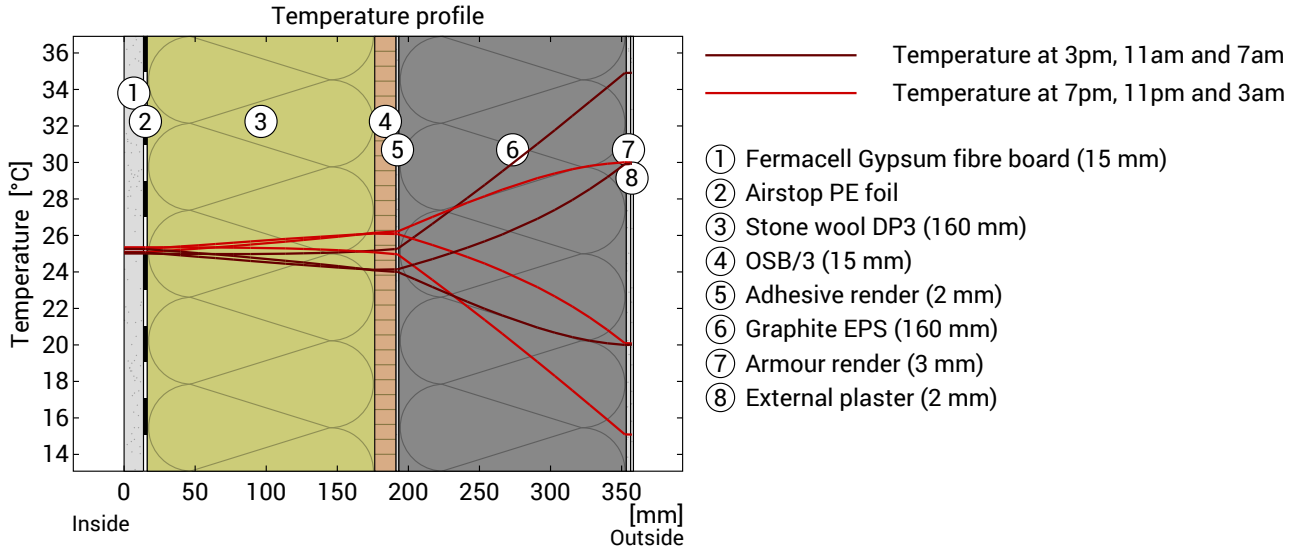
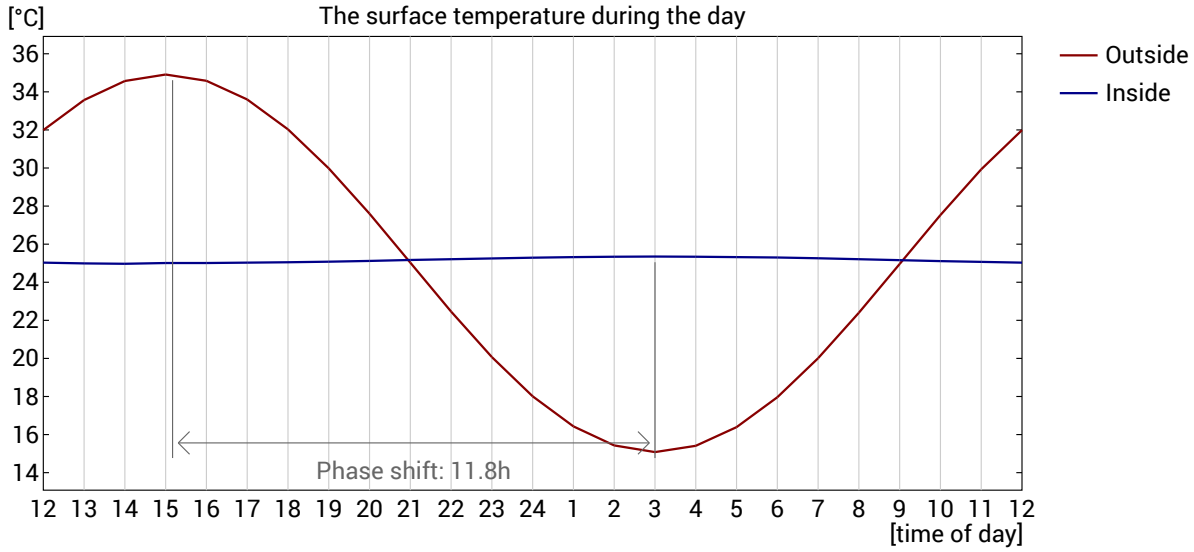
Heat protection

For the analysis of the heat protection, the temperature changes within the component were simulated during a hot summer day:





Top: Temperature profile within the component at different times. From top to bottom, brown lines: at 3 pm, 11 am and 7 am and red lines at 7 pm , 11 pm and 3 am.
Bottom: Temperature on the outer (red) and inner (blue) surface in the course of a day. The arrows indicate the location of the temperature maximum values . The maximum of the inner surface temperature should preferably occur during the second half of the night.

Phase shift*	11,8 h	Time of maximum interior temperature	3:00
Amplitude attenuation **	51,3	Thermal fluctuation on exterior surface:	19,8°C
TAV ***	0,020	Temperature fluctuation on interior surface	0,4°C

* The phase shift is the time in hours after which the temperature peak of the afternoon reaches the component interior.
** The amplitude attenuation describes the attenuation of the temperature wave when passing through the component. A value of 10 means that the temperature on the outside varies 10x stronger than on the inside, e.g. outside 15-35 °C, inside 24-26 °C.
*** The temperature amplitude ratio TAV is the reciprocal of the attenuation: TAV = 1 / amplitude attenuation

The calculations presented above have been created for a 1-dimensional cross-section of the component.