

# Steco STANDARD Ceiling Final

Ceiling  
created on 23.1.2018

## Thermal protection

$U = 0,35 \text{ W}/(\text{m}^2\text{K})$

Beidseitig beheizt: Keine Anforderung\*



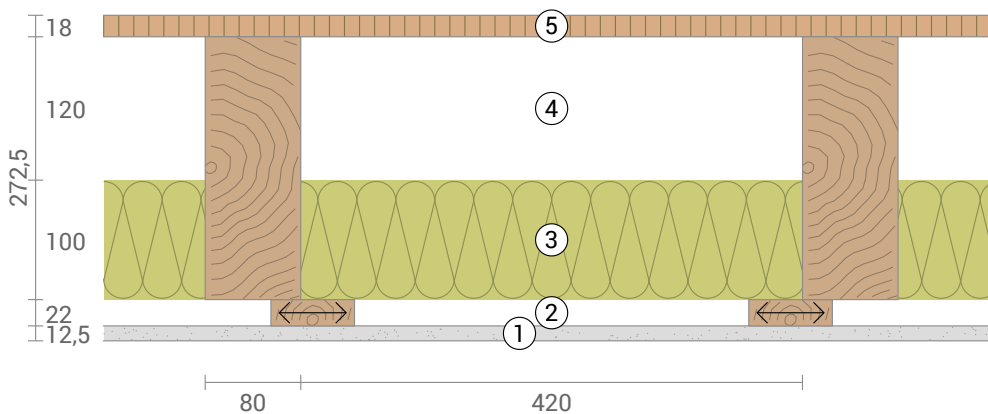
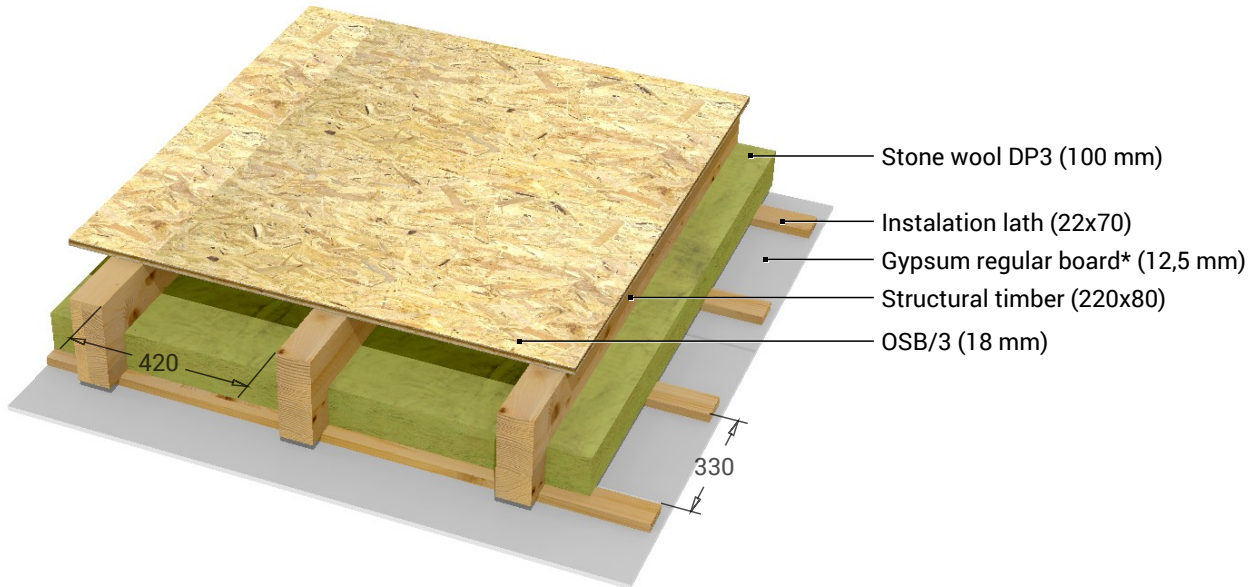
## Moisture proofing

Drying reserve:  $0 \text{ g}/\text{m}^2\text{a}$   
(leads to a worse rating)  
No condensate



## Heat protection

Temperature amplitude damping: 2,3  
phase shift: 5,2 h  
Thermal capacity inside:  $17,4 \text{ kJ}/\text{m}^2\text{K}$



- ① Gypsum regular board\* (12,5 mm)
- ② Installation gap (22 mm)
- ③ Stone wool DP3 (100 mm)
- ④ Installation gap (120 mm)
- ⑤ OSB/3 (18 mm)

<-> The (beam) positions marked with arrows are perpendicular to the main axis.

Inside air :  $20,0^\circ\text{C} / 50\%$   
Inside air 2:  $20,0^\circ\text{C} / 50\%$   
Surface temperature.:  $20,0^\circ\text{C} / 20,0^\circ\text{C}$

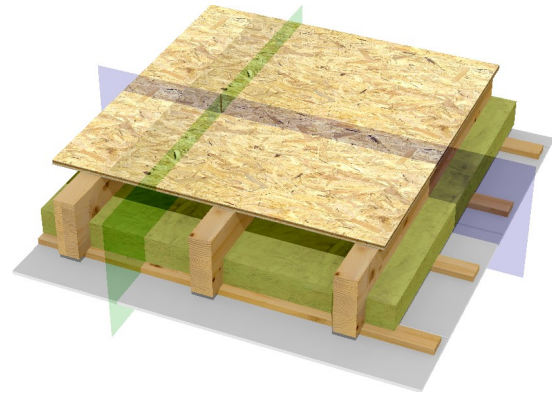
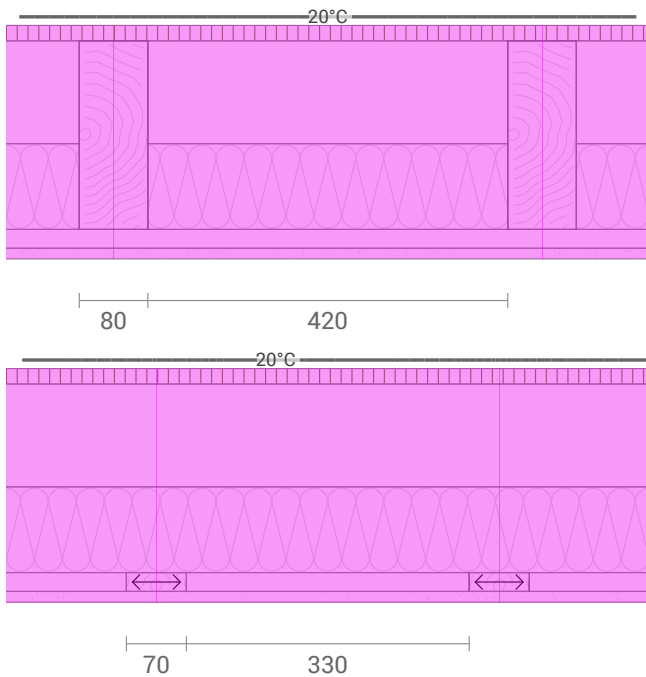
sd-value: 5,9 m  
Drying reserve:  $0 \text{ g}/\text{m}^2\text{a}$

Thickness: 27,2 cm  
Weight:  $38 \text{ kg}/\text{m}^2$   
Heat capacity:  $55 \text{ kJ}/\text{m}^2\text{K}$

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

Steco STANDARD Ceiling Final,  $U=0,35 \text{ W}/(\text{m}^2\text{K})$

## Temperature profile



Top left: Temperature profile in the blue section (see right illustration). Bottom left: Temperature profile in the green section.

## Layers (from inside to outside)

#	Material	$\lambda$ [W/mK]	R [m <sup>2</sup> K/W]	Temperatur [°C]		Weight [kg/m <sup>2</sup> ]
				min	max	
	Thermal contact resistance*		0,100	20,0	20,0	
1	1,25 cm Gypsum regular board*	0,250	0,050	20,0	20,0	8,5
2	2,2 cm Instalation gap	0,138	0,160	20,0	20,0	0,0
	2,2 cm Instalation lath (18%)	0,130	0,169			0,0
3	10 cm Stone wool DP3	0,039	2,564	20,0	20,0	2,5
	22 cm Structural timber (Width: 8 cm)	0,130	1,692	20,0	20,0	15,8
4	12 cm Instalation gap	0,750	0,160	20,0	20,0	0,1
5	1,8 cm OSB/3	0,130	0,138	20,0	20,0	11,2
	Thermal contact resistance*		0,100	20,0	20,0	
	27,25 cm Whole component		2,766			38,2

\*Thermal contact resistances according to DIN 6946 for the U-value calculation.  $R_{si}=0,25$  and  $R_{se}=0,04$  according to DIN 4108-3 were used for moisture proofing and temperature profile.

Surface temperature inside (min / average / max): 20,0°C 20,0°C 20,0°C  
Surface temperature outside (min / average / max): 20,0°C 20,0°C 20,0°C

Steco STANDARD Ceiling Final, U=0,35 W/(m<sup>2</sup>K)

### Moisture proofing

This calculation was carried out with a user-defined climate for the winter period, which deviates from DIN 4108-3.

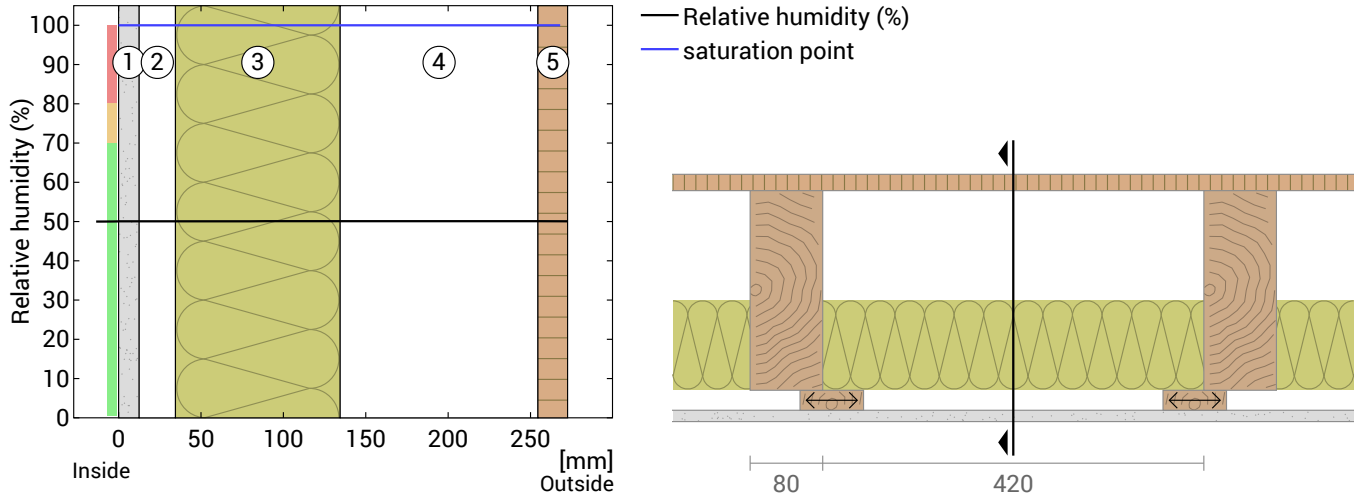
This calculation:                                inside: 20.01°C    50%    outside:    20°C    50%  
 Requested by DIN 4108-4:                    inside:    20°C    50%    outside:    -5°C    80%

This component is free of condensate under the given climate conditions.  
 The drying reserve of this component is 0 g/(m<sup>2</sup>a). Required by DIN 68800-2: at least 100 g/(m<sup>2</sup>a).  
 The moisture protection of this component is therefore assessed as inadequate.

#	Material	sd-value [m]	Condensate		Weight
			[kg/m <sup>2</sup> ]	[Gew.-%]	[kg/m <sup>2</sup> ]
1	1,25 cm Gypsum regular board*	0,05	-	-	8,5
2	2,2 cm Instalation gap	0,01	-	-	0,0
	2,2 cm Instalation lath (18%)		-	-	0,0
3	10 cm Stone wool DP3	0,10	-	-	2,5
	22 cm Structural timber (Width: 8 cm)	4,40	-	-	15,8
4	12 cm Instalation gap	0,01	-	-	0,1
5	1,8 cm OSB/3	5,40	-	-	11,2
	27,25 cm Whole component	5,89			38,2

### Humidity

The temperature of the inside surface is 20,0 °C leading to a relative humidity on the surface of 50%. Mould formation is not expected under these conditions.  
 The following figure show the relative humidity inside the component.



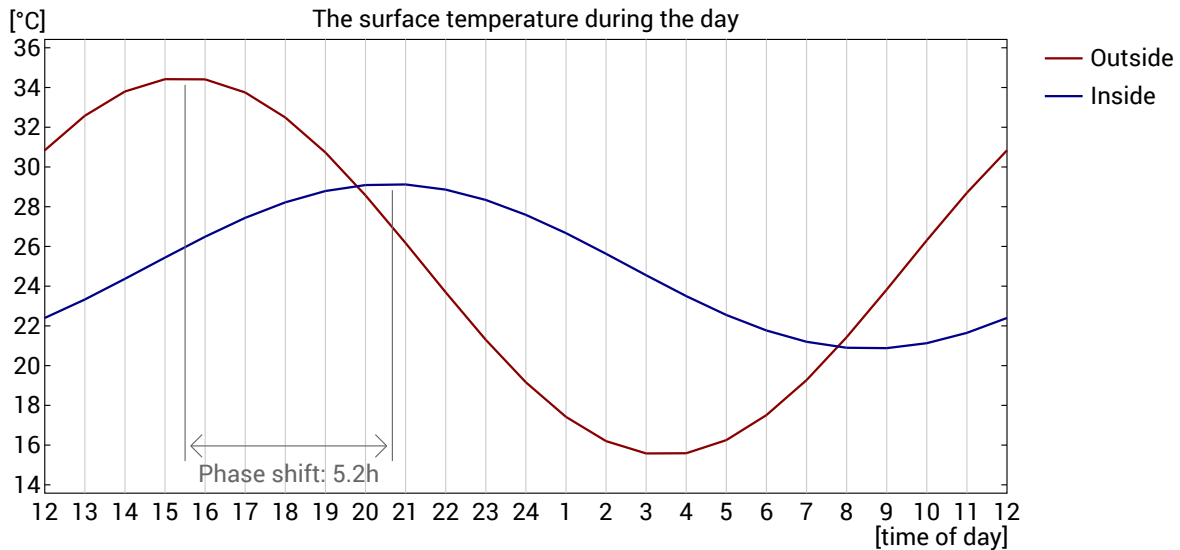
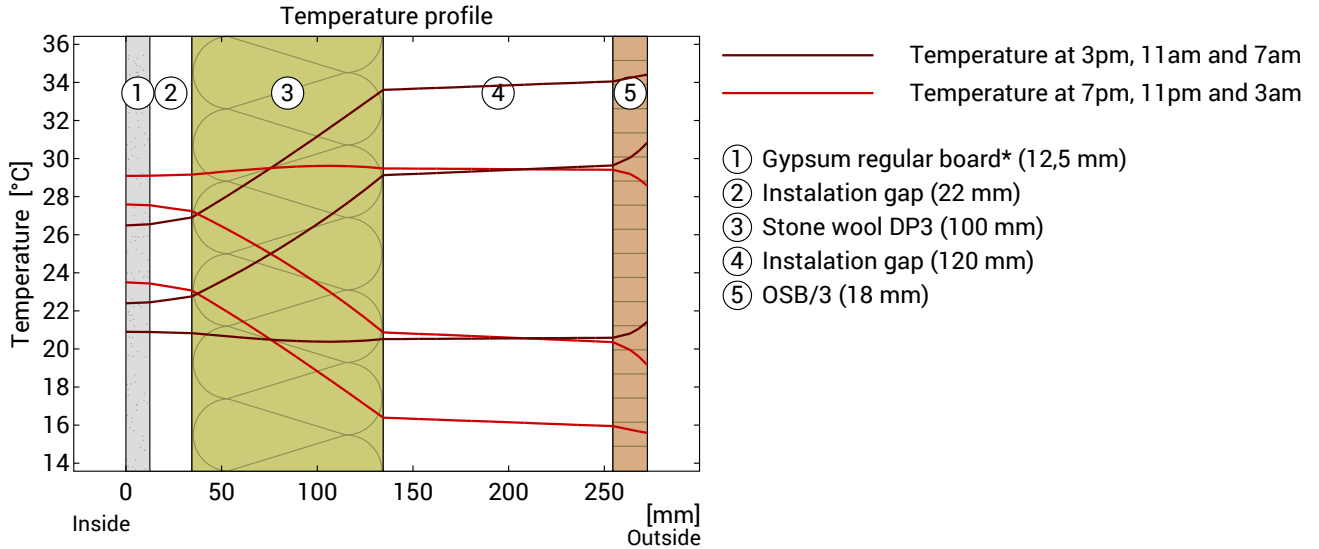
- ① Gypsum regular board\* (12,5 mm)    ③ Stone wool DP3 (100 mm)    ⑤ OSB/3 (18 mm)  
 ② Instalation gap (22 mm)    ④ Instalation gap (120 mm)

To calculate the diffusion currents a two-dimensional finite element method was used. More information on the section 'humidity' on the input form.  
 Layers marked with <-> run parallel to the illustrated cutting plane and were not taken into account in the moisture protection calculation.

Steco STANDARD Ceiling Final, U=0,35 W/(m²K)

## 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*	5,2 h	Time of maximum interior temperature	20:45
Amplitude attenuation **	2,3	Thermal fluctuation on exterior surface:	19,0°C
TAV ***	0,436	Temperature fluctuation on interior surface	8,3°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.