

# Steco STANDARD Pitched roof Final

## Thermal protection

$U = 0,153 \text{ W}/(\text{m}^2\text{K})$

EnEV Bestand\*:  $U < 0,24 \text{ W}/(\text{m}^2\text{K})$



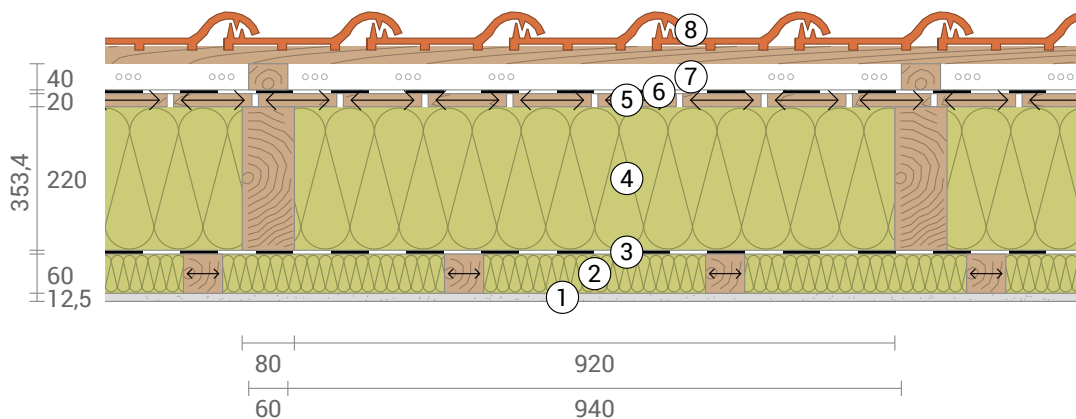
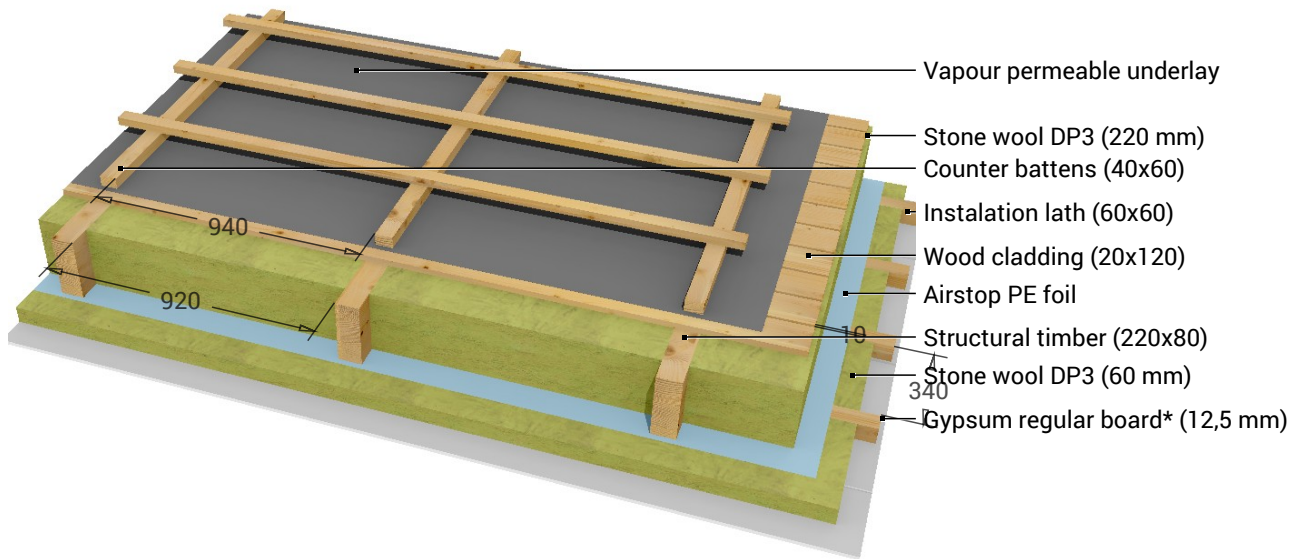
## Moisture proofing

Drying reserve:  $3832 \text{ g}/\text{m}^2\text{a}$   
No condensate



## Heat protection

Temperature amplitude damping: 6,6  
phase shift: 7,9 h  
Thermal capacity inside:  $16,8 \text{ kJ}/\text{m}^2\text{K}$



- |                                   |                             |                                    |
|-----------------------------------|-----------------------------|------------------------------------|
| ① Gypsum regular board* (12,5 mm) | ④ Stone wool DP3 (220 mm)   | ⑦ Rear ventilated level (40 mm)    |
| ② Stone wool DP3 (60 mm)          | ⑤ Air gap (20 mm)           | ⑧ Roof lath with covering (103 mm) |
| ③ Airstop PE foil                 | ⑥ Vapour permeable underlay |                                    |

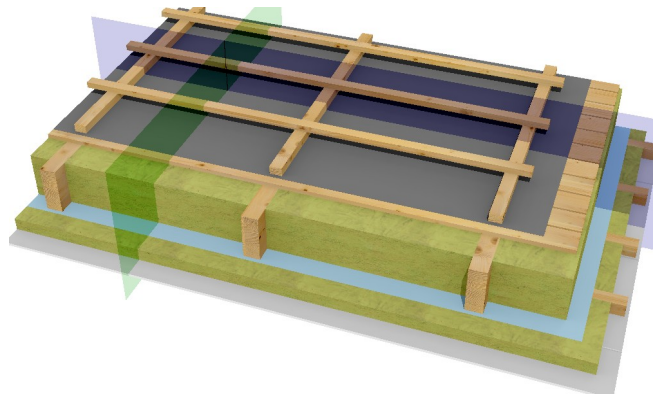
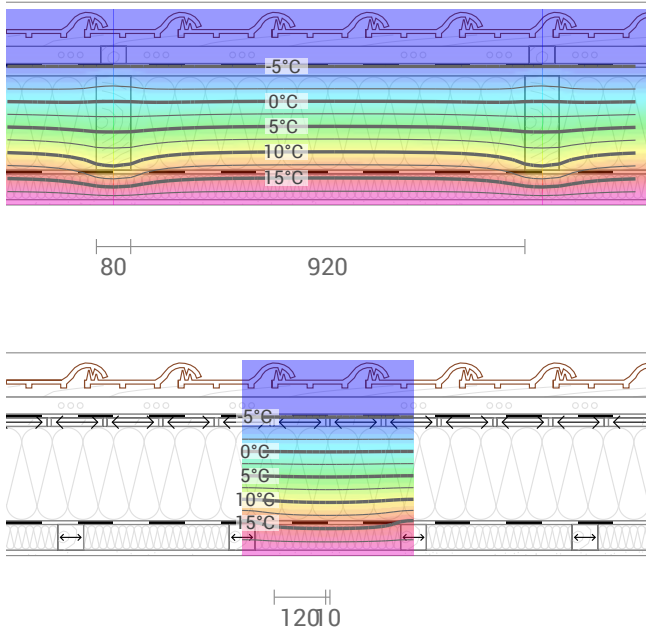
<-> The (beam) positions marked with arrows are perpendicular to the main axis.

Inside air :	20,0°C / 50%	sd-value:	100,9 m	Thickness:	45,6 cm
Outside air:	-5,0°C / 80%	Drying reserve:	$3832 \text{ g}/\text{m}^2\text{a}$	Weight:	$77 \text{ kg}/\text{m}^2$
Surface temperature.:	18,9°C / -4,9°C	Heat capacity:	$29 \text{ kJ}/\text{m}^2\text{K}$		

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

Steco STANDARD Pitched roof Final, U=0,15 W/(m<sup>2</sup>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	18,9	20,0	
1	1,25 cm Gypsum regular board*	0,250	0,050	18,6	19,2	8,5
2	6 cm Stone wool DP3	0,039	1,538	11,0	19,0	1,8
	6 cm Instalation lath (15%)	0,130	0,462			0,0
3	0,02 cm Airstop PE foil	0,500	0,000	11,0	14,0	0,2
4	22 cm Stone wool DP3	0,039	5,641	-4,4	14,0	6,1
	22 cm Structural timber (8,0%)	0,130	1,692	-3,5	11,5	7,9
5	2 cm Air gap	0,125	0,160	-4,9	-3,5	0,0
	2 cm Wood cladding (92%)	0,130	0,154			0,0
6	0,07 cm Vapour permeable underlay	0,500	0,001	-4,9	-4,7	0,2
	Thermal contact resistance*		0,100	-5,0	-4,7	
7	4 cm Rear ventilated level (outside air)			-5,0	-5,0	0,0
8	10,3 cm Roof lath with covering			-5,0	-5,0	51,5
	45,64 cm Whole component		6,860			77,3

\*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 19,1°C 19,2°C  
Surface temperature outside (min / average / max): -4,9°C -4,9°C -4,7°C

## Steco STANDARD Pitched roof Final, U=0,15 W/(m²K)

### Moisture proofing

This component is free of condensate under the given climate conditions.

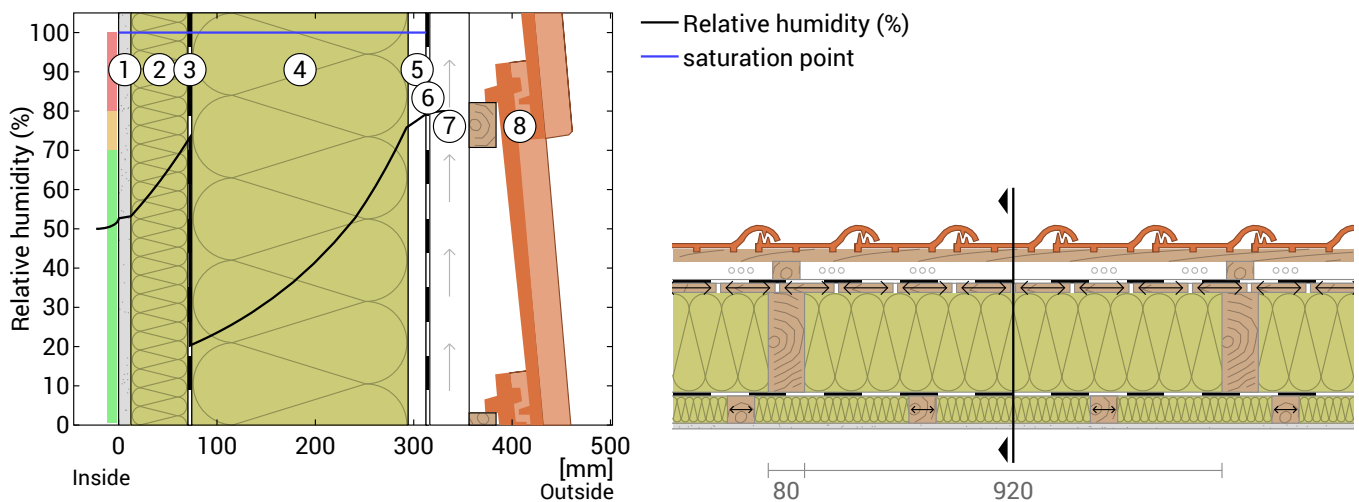
The drying reserve of this component is 3832 g/(m²a). Required by DIN 68800-2: at least 250 g/(m²a).

#	Material	sd-value [m]	Condensate [kg/m²] [Gew.-%]	Weight [kg/m²]
1	1,25 cm Gypsum regular board*	0,05	-	8,5
2	6 cm Stone wool DP3	0,06	-	1,8
	6 cm Instalation lath (15%)		-	0,0
3	0,02 cm Airstop PE foil	100,00	-	0,2
4	22 cm Stone wool DP3	0,22	-	6,1
	22 cm Structural timber (8,0%)	11,00	-	7,9
5	2 cm Air gap	0,01	-	0,0
	2 cm Wood cladding (92%)		-	0,0
6	0,07 cm Vapour permeable underlay	0,10	-	0,2
	45,64 cm Whole component	100,94		77,3

### 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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| ③ Airstop PE foil                 | ⑥ Vapour permeable underlay |                                    |

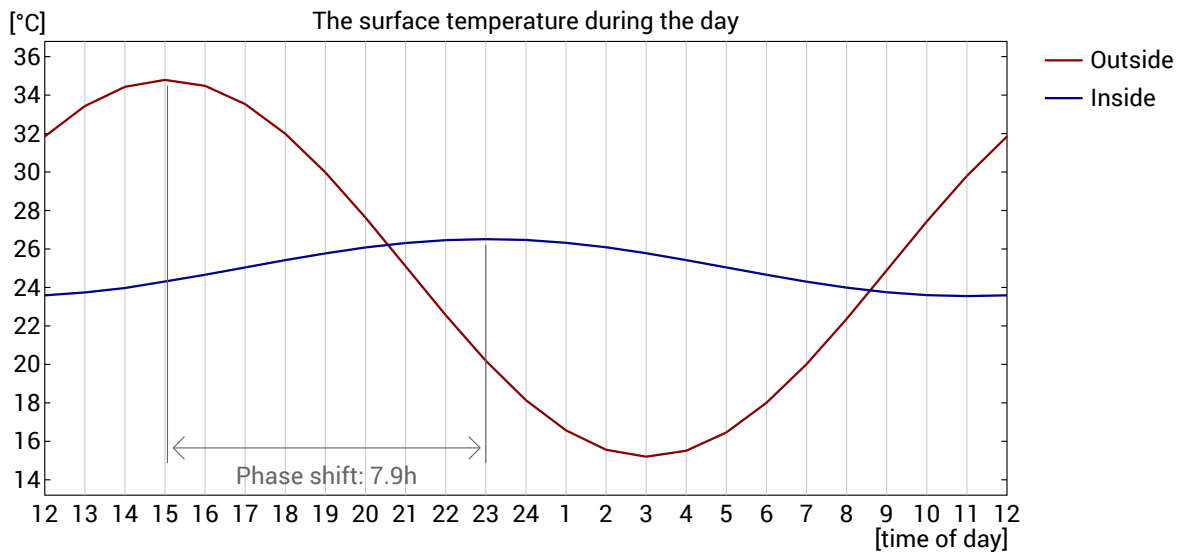
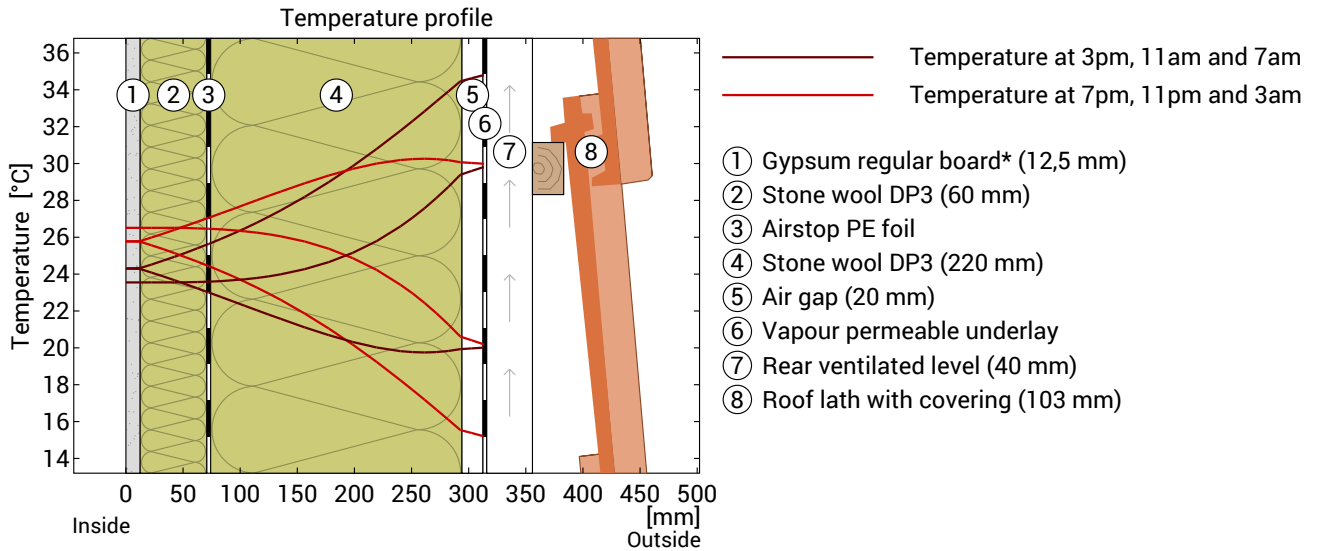
To calculate the diffusion currents a two-dimensional finite element method was used. More information on the section 'humidity' on the input form.

Layers marked with <-> run parallel to the illustrated cutting plane and were not taken into account in the moisture protection calculation.

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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*	7,9 h	Time of maximum interior temperature	23:00
Amplitude attenuation **	6,6	Thermal fluctuation on exterior surface:	19,6°C
TAV ***	0,151	Temperature fluctuation on interior surface	3,0°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.