

M-Cabin ground

Floor
created on 6.10.2020

Thermal protection

$U = 0,33 \text{ W}/(\text{m}^2\text{K})$

EnEV Bestand*: $U < 0,3 \text{ W}/(\text{m}^2\text{K})$



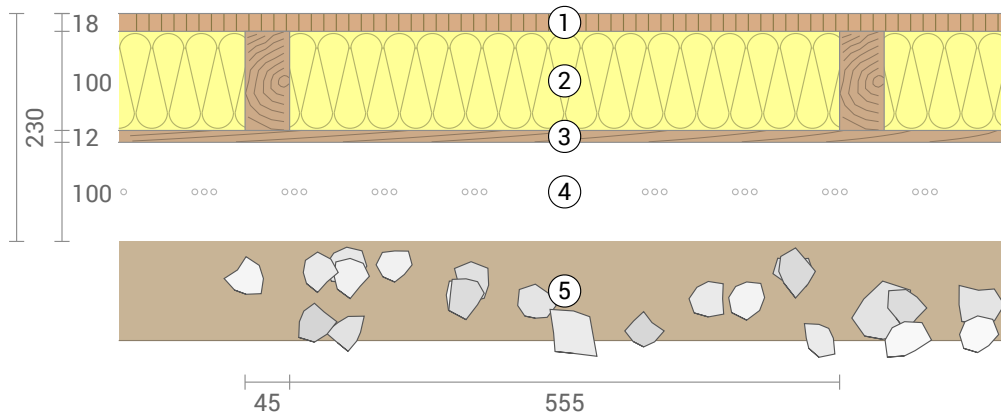
Moisture proofing

No condensate



Heat protection

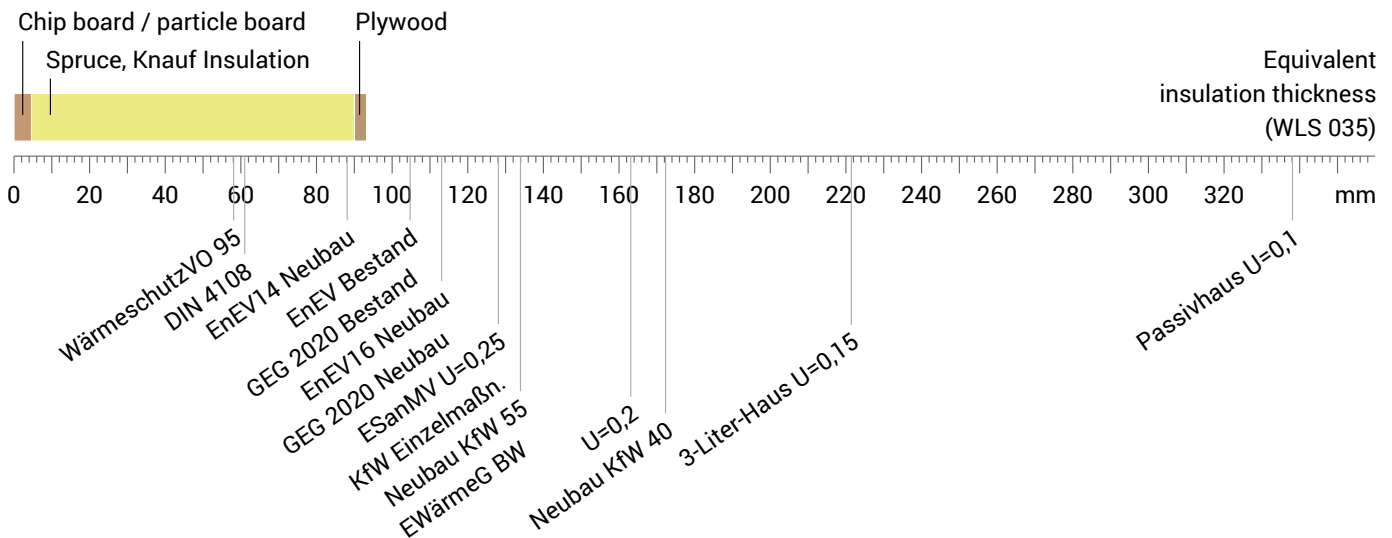
Component is adjacent to earth:
TAV and phase non relevant
Thermal capacity inside: $24 \text{ kJ}/\text{m}^2\text{K}$



- ① Chip board / particle board (18 mm)
- ② Knauf Insulation (100 mm)
- ③ Plywood (12 mm)
- ④ Rear ventilated level (100 mm)
- ⑤ Soil

Impact of each layer and comparison to reference values

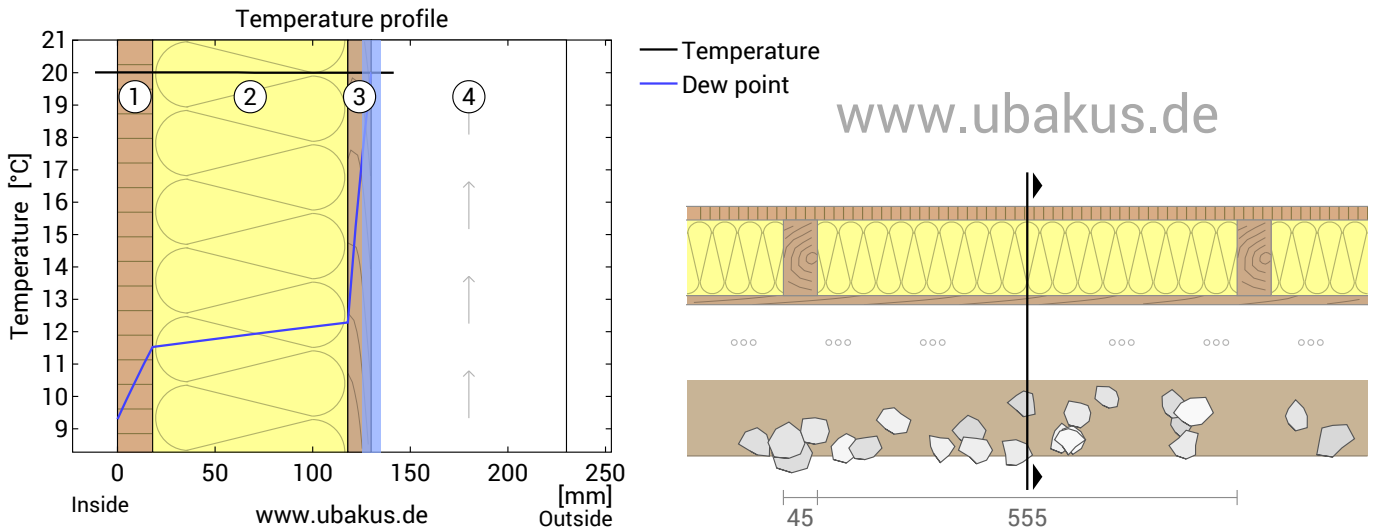
For the following figure, the thermal resistances of the individual layers were converted in millimeters insulation. The scale refers to an insulation of thermal conductivity $0,035 \text{ W}/\text{mK}$.



Inside air :	20,0°C / 50%		Thickness:	23,0 cm
Ground:	20,0°C / 100%	sd-value: 1,7 m	Weight:	27 kg/m ²
Surface temperature.:	20,0°C / 20,0°C		Heat capacity:	47 kJ/m ² K

M-Cabin ground, $U=0,33 \text{ W}/(\text{m}^2\text{K})$

Temperature profile



- ① Chip board / particle board (18 mm)
- ② Knauf Insulation (100 mm)
- ③ Plywood (12 mm)
- ④ Rear ventilated level (100 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 [m ² K/W]	Temperatur [°C]		Weight [kg/m ²]
				min	max	
	Thermal contact resistance*		0,170	20,0	20,0	
1	1,8 cm Chip board / particle board	0,140	0,129	20,0	20,0	11,7
2	10 cm Knauf Insulation	0,035	2,857	20,0	20,0	4,6
	10 cm Spruce (7,5%)	0,130	0,769	20,0	20,0	3,4
3	1,2 cm Plywood	0,160	0,075	20,0	20,0	7,2
	Thermal contact resistance*		0,170	20,0	20,0	
4	10 cm Rear ventilated level (outside air)			20,0	20,0	0,0
5	Soil			20,0	20,0	39,1
23 cm Whole component			2,990			26,9

*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

M-Cabin ground, $U=0,33 \text{ W}/(\text{m}^2\text{K})$

Moisture proofing

For the calculation of the amount of condensation water, the component was exposed to the following constant climate for 90 days: inside: 20.01 °C und 50% Humidity; outside: 20°C und 100% Humidity (Climate according to user input).

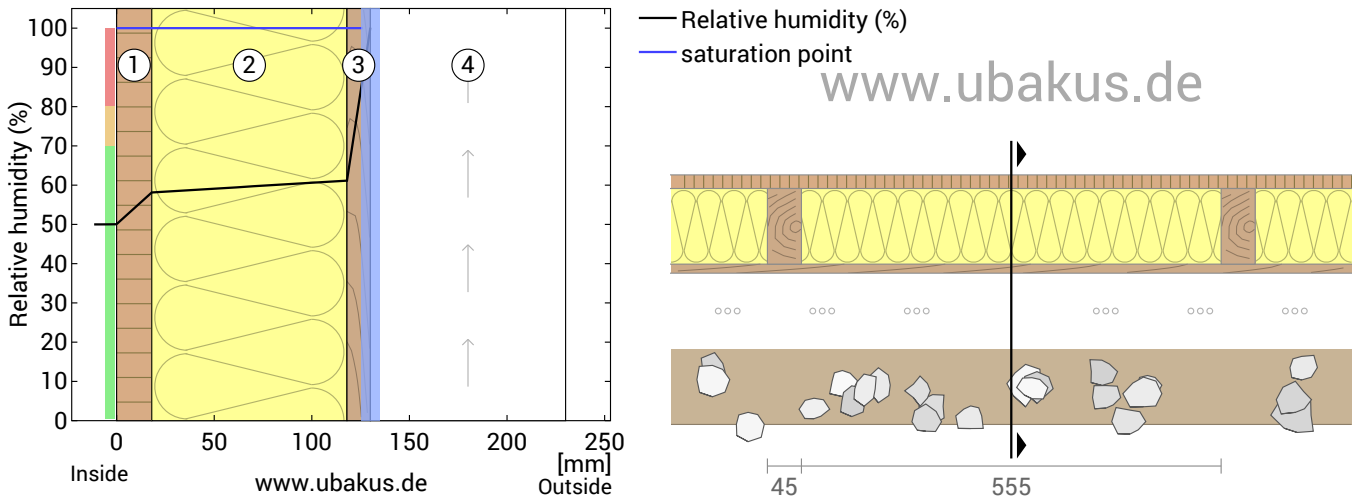
This component is free of condensate under the given climate conditions.

#	Material	sd-value [m]	Condensate [kg/m ²] [Gew.-%]	Weight [kg/m ²]
1	1,8 cm Chip board / particle board	0,27	- -	11,7
2	10 cm Knauf Insulation	0,10	- -	4,6
	10 cm Spruce (7,5%)	2,00	- -	3,4
3	1,2 cm Plywood	1,32	- -	7,2
	23 cm Whole component	1,75		26,9

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 shows the relative humidity inside the component.



- ① Chip board / particle board (18 mm) ③ Plywood (12 mm)
 ② Knauf Insulation (100 mm) ④ Rear ventilated level (100 mm)

Notes: Calculation using the Ubakus 2D-FE method. Convection and the capillarity of the building materials were not considered. The drying time may take longer under unfavorable conditions (shading, damp / cool summers) than calculated here.