Energy Wall Retrofit IS 3000
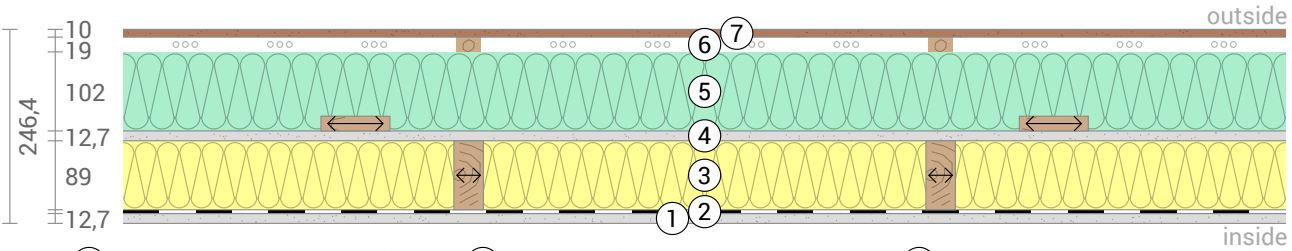
Thermal protection

$U = 0{,}19$ W/(m²K) R 30 (hr.ft2.°F/BTU)

Heat protection

Temperature amplitude damping: 6,9
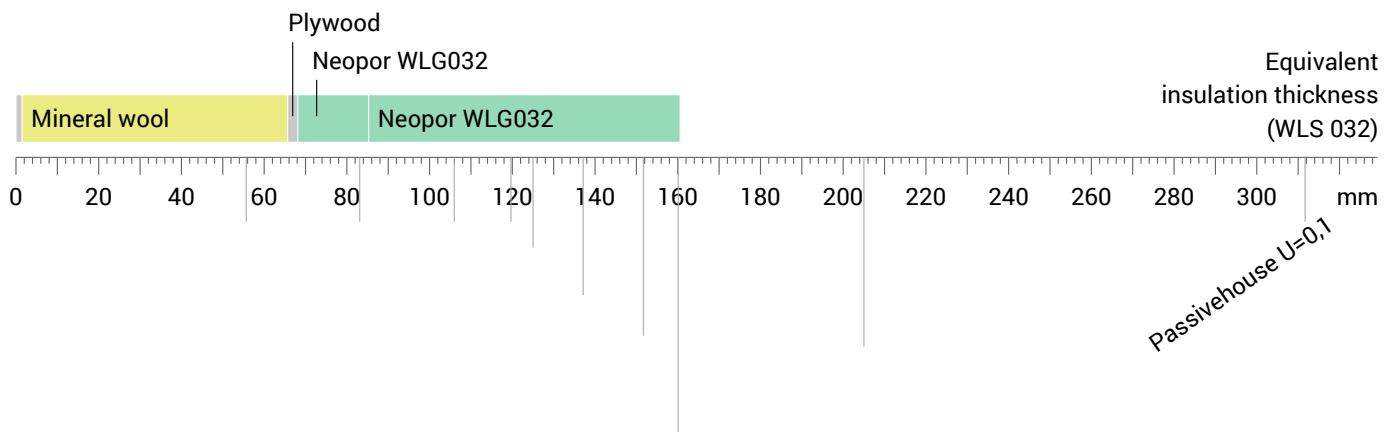phase shift: 7,9 h
Thermal capacity inside: 15,6 kJ/m²K

excellent   insufficient   excellent   insufficient

246,4 | 10 / 19 / 102 / 12,7 / 89 / 12,7

outside

inside

①	Gypsum board (12,7 mm)	④	Plywood (12,7 mm)	⑦	Hardie Plank Siding (10 mm)
②	Existing Vapour Barrier	⑤	Neopor WLG032 (102 mm)		
③	Mineral wool (89 mm)	⑥	Rear ventilated level (19 mm)		

<-> Layers marked by arrows are perpendicular to the main axis.

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 0,032 W/mK.

Plywood
Neopor WLG032

Mineral wool   Neopor WLG032

Equivalent
insulation thickness
(WLS 032)

0   20   40   60   80   100   120   140   160   180   200   220   240   260   280   300   mm

Passivehouse U=0,1

Inside air :	20,0°C / 45%		Thickness:	24,6 cm
Outside air:	-30,0°C / 70%		Weight:	40 kg/m²
Surface temperature.:	17,9°C / -29,7°C		Heat capacity:	21 kJ/m²K

U-Value calculation according to DIN EN ISO 6946

#	Material	Dicke [cm]	λ [W/mK]	R [m²K/W]
	Thermal contact resistance inside (Rsi)			0,130
1	Gypsum board	1,27	0,250	0,051
2	Existing Vapour Barrier	0,10	0,400	0,003
3	Mineral wool	8,90	0,040	2,225
	Spruce (6,2%)	8,90	0,130	0,685
4	Plywood	1,27	0,150	0,085
5	Neopor WLG032	10,20	0,032	3,188
	Spruce (Width: 8,9 cm)	1,90	0,130	0,146
	Thermal contact resistance outside (Rse)			0,130

Thermal contact resistances have been taken from DIN 6946 Table 7.
Rsi: heat flow direction horizontally
Rse: heat flow direction horizontally, outside: Ventilation level

Upper limit of thermal resistance $R_{tot;upper}$ = 5,663 m²K/W.
Lower limit of thermal resistance $R_{tot;lower}$ = 5,450 m²K/W.
Check applicability: $R_{tot;upper}$ / $R_{tot;lower}$ = 1,039 (maximum allowed: 1,5)

The procedure may be used.

Thermal resistance R_{tot} = ($R_{tot;upper}$ + $R_{tot;lower}$)/2 = 5,556 m²K/W
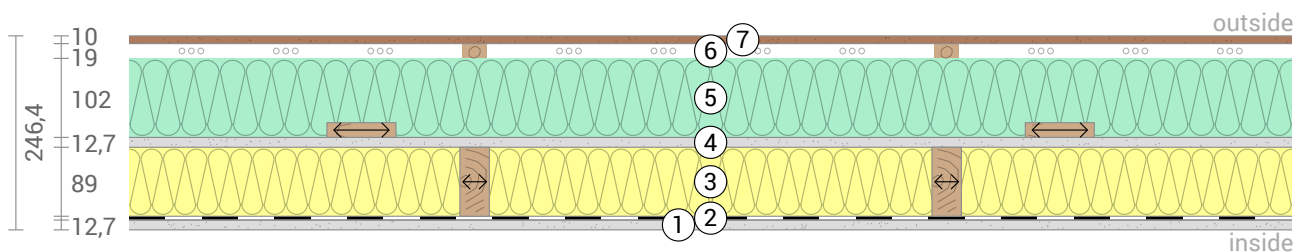Estimated maximum relative uncertainty according to section 6.7.2.5: 1,9%

Heat transfer coefficient U = 1/R_{tot} = 0,180 W/(m²K)

Corrections for air gaps / mechanical fastening elements

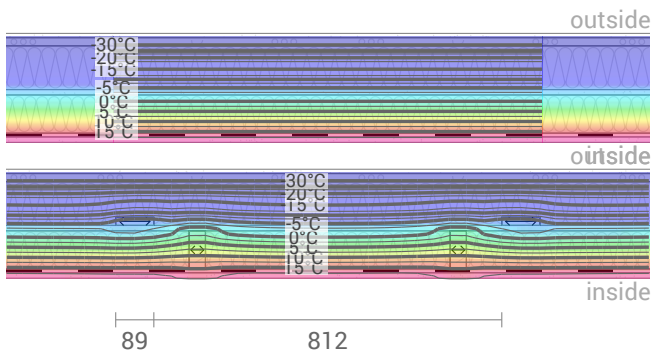Anchorage of layer 5.1 (Neopor WLG032)   ΔU = 0,010 W/(m²K)

Corrected heat transfer coefficient **U_C = 0,19 W/(m²K)**

This component includes several inhomogeneous layers of different overall width. For all the calculations it was assumed that the layer arrangement is repeated in width all 90,1 cm. This, however, is not true for at least layer 3 with a total width of 60,9 cm and can cause increased inaccuracy of the U-value.

Energy Wall Retrofit IS 3000, U=0,19 W/(m²K)

Temperature profile

| 89 | 812 |

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	λ [W/mK]	R [m²K/W]	Temperatur [°C] min	max	Weight [kg/m²]
		Thermal contact resistance*		0,250	17,9	20,0	
1	1,27 cm	Gypsum board	0,250	0,051	17,4	17,9	8,6
2	0,1 cm	Existing Vapour Barrier	0,400	0,003	17,4	17,4	0,9
3	8,9 cm	Mineral wool	0,040	2,225	-1,6	17,4	1,7
	8,9 cm	Spruce (6,2%)	0,130	0,685			2,0
4	1,27 cm	Plywood	0,150	0,085	-2,4	-1,6	7,6
5	10,2 cm	Neopor WLG032	0,032	3,188	-29,7	-2,4	1,5
	1,9 cm	Spruce (Width: 8,9 cm)	0,130	0,146			0,8
		Thermal contact resistance*		0,040	-30,0	-29,7	
6	1,9 cm	Rear ventilated level (outside air)			-30,0	-30,0	0,0
7	1 cm	Hardie Plank Siding			-30,0	-30,0	16,5
	24,64 cm	Whole component		5,264			39,7

*Thermal contact resistances according to DIN 4108-3 for moisture protection and temperature profile. The values for the U-value calculation can be found on the page 'U-value calculation'.

Thermal bridges

The U-value includes the following surcharges for air gaps and / or mechanical fasteners in accordance with DIN 6946:
Anchorage of layer 5.1 (Neopor WLG032)   0,010 W/(m²K)

Surface temperature inside (min / average / max):   17,9°C   17,9°C   17,9°C
Surface temperature outside (min / average / max):   -29,7°C   -29,7°C   -29,7°C