Niall Crosson
Group Technical Manager BTech, MEngSc,MIEI, CEPHC

Documentation of the component
Thermal transmittance (U-value) according to BS EN ISO 6946
Source: **own catalogue - Intermediate floors**
Component: **Passive360Ceiling**

UP

This illustration of inhomogeneous layers is provided only to assist in visualising the arrangement.

On the basis of the given information about the inhomogeneous layers, it is not possible to estimate how and where bearing elements intersect each other. It was assumed that the layers intersect crosswise. The size of the areas was calculated corresponding to their percentage of the whole area.

DOWN

Assignment: Floor/Ceiling - semi exposed, heat flow upwards

		Manufacturer	Name	Thickness [m], number	Lambda [W/(mK)]	Q	R [m²K/W]
		Rse					0.1000
☑	1	Dammstatt	Dammstatt	0.2250	0.037	E	6.0811
☑	2	Inhomogeneous material layer	consisting of:	0.2250	ø 0.045		4.9592
	2a	Dammstatt	Dammstatt	91.00 %	0.037	E	-
	2b	BS EN 12524	Softwood Timber [500 kg/m³]	09.00 %	0.130	D	-
☑	3	pro clima	INTELLO PLUS	0.0002	0.170	E	0.0012
☑	4	Inhomogeneous material layer	consisting of:	0.0400	ø 0.291		0.1374
	4a	BS EN ISO 6946	Unventilated air layer: 50 mm, upwards heat flow	88.00 %	0.313	D	-
	4b	BS EN 12524	Softwood Timber [500 kg/m³]	12.00 %	0.130	D	-
☑	5	British Gypsum Limited	Gyproc Wallboard	0.0150	0.190	D	0.0789
		Rsi					0.1000
				0.5052			

The unheated space is regarded with a reduction factor b according to EN ISO 13789.

b = 1.00

$R_T = (R_T' + R_T'')/2 = 11.74$ m²K/W

$U = b * 1/R_T = 0.09$ W/(m²K)

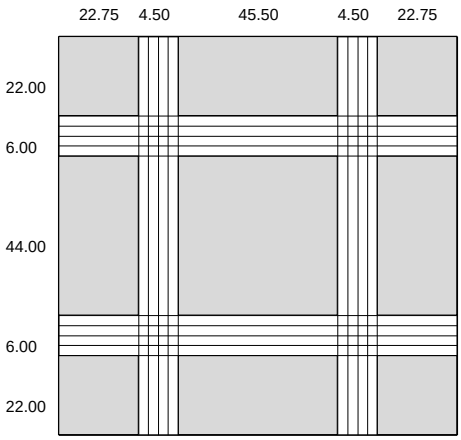
Q .. The physical values of the building materials has been graded by their level of quality. These 5 levels are the following
A .. A: Data is entered and validated by the manufacturer or supplier. Data is continuously tested by 3rd party.
B .. B: Data is entered and validated by the manufacturer or supplier. Data is certified by 3rd party
C .. C: Data is entered and validated by the manufacturer or supplier.
D .. D: Information is entered by BuildDesk without special agreement with the manufacturer, supplier or others.
E .. E: Information is entered by the user of the BuildDesk software without special agreement with the manufacturer, supplier or others.

U = **0.09** W/(m²K) R_T= **11.74** m²K/W

Niall Crosson
Group Technical Manager BTech, MEngSc,MIEI, CEPHC

Documentation of the component
Thermal transmittance (U-value) according to BS EN ISO 6946
Source: **own catalogue - Intermediate floors**
Component: **Passive360Ceiling**

Draft of the component (portion in %):



The intersection of the inhomogeneous layers results in 4 Zones (A, B, C, D). Information given in %.

A	5.01 + 10.01 + 5.01 + 10.01 + 20.02 + 10.01 + 5.01 + 10.01 + 5.01 consisting of material layers: 1, 2a, 3, 4a, 5	= 80.08%
B	0.99 + 1.98 + 0.99 + 0.99 + 1.98 + 0.99 consisting of material layers: 1, 2b, 3, 4a, 5	= 7.92%
C	1.37 + 2.73 + 1.37 + 1.37 + 2.73 + 1.37 consisting of material layers: 1, 2a, 3, 4b, 5	= 10.92%
D	0.27 + 0.27 + 0.27 + 0.27 consisting of material layers: 1, 2b, 3, 4b, 5	= 1.08%

Upper limit of the thermal transfer resistance R

U_A [W/(m²K)] =	$\frac{1}{(\Sigma R_{i,A}) + R_{si} + R_{se}}$ =	$\frac{1}{12.37 + 0.1 + 0.1}$	= 0.08
U_B [W/(m²K)] =	$\frac{1}{(\Sigma R_{i,B}) + R_{si} + R_{se}}$ =	$\frac{1}{8.02 + 0.1 + 0.1}$	= 0.12
U_C [W/(m²K)] =	$\frac{1}{(\Sigma R_{i,C}) + R_{si} + R_{se}}$ =	$\frac{1}{12.55 + 0.1 + 0.1}$	= 0.08
U_D [W/(m²K)] =	$\frac{1}{(\Sigma R_{i,D}) + R_{si} + R_{se}}$ =	$\frac{1}{8.20 + 0.1 + 0.1}$	= 0.12

$$R_T' = \frac{1}{A * U_A + B * U_B + C * U_C + D * U_D} = 12.02\ m^2K/W$$

Lower limit of the thermal transfer resistance R

R_{se} [m²K/W]			= 0.1
R_1'' [m²K/W]	= d_1/λ_1 =	0.2250 / 0.037	= 6.08
R_2'' [m²K/W]	= $d_2/(\lambda_{2a} * (A + C) + \lambda_{2b} * (B + D))$ =	0.2250 /(0.037 * 91.00% + 0.130 * 9.00%)	= 4.96
R_3'' [m²K/W]	= d_3/λ_3 =	0.0002 / 0.170	= 0.00
R_4'' [m²K/W]	= $d_4/(\lambda_{4a} * (A + B) + \lambda_{4b} * (C + D))$ =	0.0400 /(0.313 * 88.00% + 0.130 * 12.00%)	= 0.14
R_5'' [m²K/W]	= d_5/λ_5 =	0.0150 / 0.190	= 0.08
R_{si} [m²K/W]			= 0.1

$$R_T'' = \Sigma R_i'' + R_{si} + R_{se} = 11.46\ m^2K/W$$