

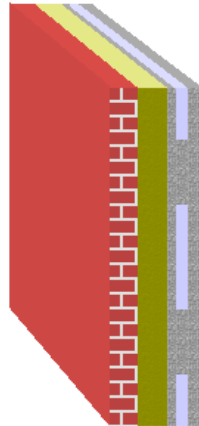


Documentation of the component
Thermal transmittance (U-value) according to BS EN ISO 6946
Source: **own catalogue - Besblock**
Component: **Besblock Kappa Investigation 4**

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OUTSIDE

INSIDE



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

Assignment: External wall

	Manufacturer	Name	Thickness [m], number	Lambda [W/(mK)]	Q	R [m²K/W]
		Rse				0.0400
<input checked="" type="checkbox"/>	1	Generic Building Materials	Brick outer leaf & Mortar outer leaf (f = 0.000 / automatic disregarding acc. BRE 4.4.3)	0.1020	0.770	D 0.1325
<input checked="" type="checkbox"/>	2	Generic Building Materials	Mineral wool batt - Cavity Batts	0.1000	0.038	D 2.6316
		Fixings	Ancon RT2 50-100mm cavity No./m²:	2.5/m²	17.000	C -
		Fixings	equivalent diameter: 3.090194E-03 m / alpha: 0.800			
		Air gaps	Level 1: dU" = 0.01 W/(m²K)			
<input checked="" type="checkbox"/>	3	Generic Data via Besblock	Dense Natural Aggregate Concrete	0.0298	0.990	E 0.0301
<input checked="" type="checkbox"/>	4	Inhomogeneous material layer	consisting of:	0.0425	∅ 0.499	0.0852
	4a	BS EN ISO 6946	Unventilated airspace small: horizontal heat flow	61.95 %	0.197	D -
		Airspace: mean temp.: 10°C / deltaT: <5 K / Epsilon1: 0.9 W/(m²K) / Epsilon2: 0.9 W/(m²K)				
	4b	Generic Data via Besblock	Dense Natural Aggregate Concrete	38.05 %	0.990	E -
<input checked="" type="checkbox"/>	5	Generic Data via Besblock	Dense Natural Aggregate Concrete	0.0298	0.990	E 0.0301
<input checked="" type="checkbox"/>	6	BS EN 12524	Gypsum plastering	0.0130	0.570	D 0.0228
		Rsi				0.1300
						0.3170

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$$R_T = (R_T' + R_T'')/2 = 3.13 \text{ m}^2\text{K/W}$$

Correction to U-value for	according to	delta U [W/(m ² K)]
Mechanical fasteners	BS EN ISO 6946 Annex D	0.002
Air gaps	BS EN ISO 6946 Annex D	0.007
<i>Air gaps and fixings corrections need not be applied, as their total effect is less than 3% (Annex D BS 6946:1996).</i>		
		0.000

$$U = 1/R_T + \Sigma\Delta U = 0.32 \text{ W/(m}^2\text{K)}$$

- 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.
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U_{max} = 0.35 W/(m²K) U = 0.32 W/(m²K) R_T = 3.13 m²K/W

Source of U_{max} value: England, Wales: Approved Document L1A (2006), Table 2 - New Build Dwellings

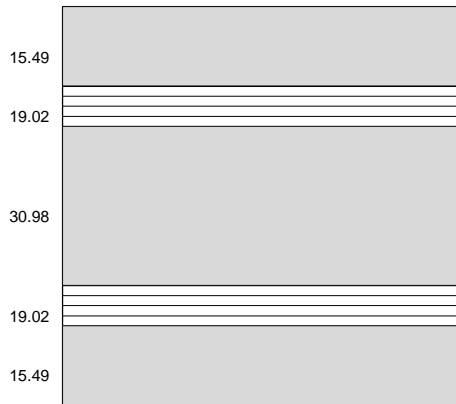
Calculated with BuildDesk 3.4.4



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Draft of the component (portion in %):



The inhomogeneous layer consists of two zones (A, B).
The portion is given in %.

A	 15.49 + 30.98 + 15.49 consisting of material layers: 1, 2, 3, 4a, 5, 6	= 61.95%
B	 19.03 + 19.03 consisting of material layers: 1, 2, 3, 4b, 5, 6	= 38.05%

Upper limit of the thermal transfer resistance R

$$U_A [W/(m^2K)] = \frac{1}{(\sum R_{i,A}) + R_{si} + R_{se}} = \frac{1}{3.06 + 0.13 + 0.04} = 0.31$$

$$U_B [W/(m^2K)] = \frac{1}{(\sum R_{i,B}) + R_{si} + R_{se}} = \frac{1}{2.89 + 0.13 + 0.04} = 0.33$$

$$R_T' = \frac{1}{A * U_A + B * U_B} = 3.16 \text{ m}^2\text{K/W}$$

Lower limit of the thermal transfer resistance R

$R_{se} [m^2K/W]$		= 0.04
$R_1'' [m^2K/W] = d_1 / \lambda_1 =$	0.1020 / 0.770	= 0.13
$R_2'' [m^2K/W] = d_2 / \lambda_2 =$	0.1000 / 0.038	= 2.63
$R_3'' [m^2K/W] = d_3 / \lambda_3 =$	0.0298 / 0.990	= 0.03
$R_4'' [m^2K/W] = d_4 / (\lambda_{4a} * A + \lambda_{4b} * B) =$	0.0425 / (0.197 * 61.95% + 0.990 * 38.05%)	= 0.09
$R_5'' [m^2K/W] = d_5 / \lambda_5 =$	0.0298 / 0.990	= 0.03
$R_6'' [m^2K/W] = d_6 / \lambda_6 =$	0.0130 / 0.570	= 0.02
$R_{si} [m^2K/W]$		= 0.13

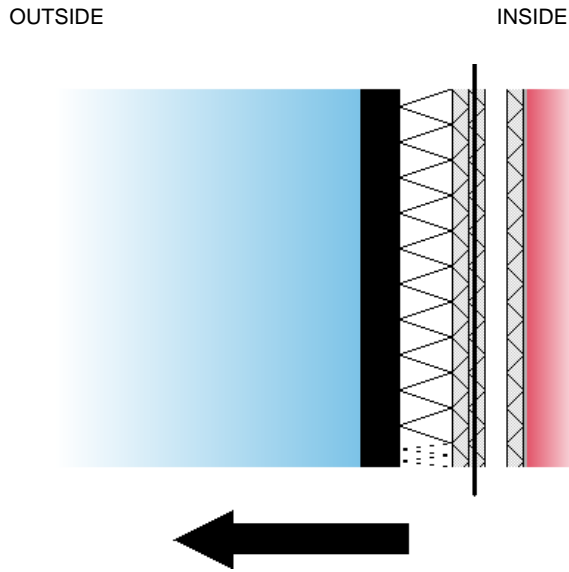
$$R_T'' = \sum R_i'' + R_{si} + R_{se} = 3.10 \text{ m}^2\text{K/W}$$



Documentation of the component
Heat capacity

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Source: **own catalogue - Besblock**
Component: **Besblock Kappa Investigation 4**



The list of materials shown below may differ from those in the U-value calculation printout. Only material layers which are used in the heat capacity calculation are listed.

Single material layers shown in the U-value calculation printout may be separated to meet the exclusion criteria:

- A .. The total thickness of the layers exceed 0.1 m.
- B .. The mid point in the construction is reached.

For insulation layers the following criteria applies:

- C .. An insulating layer is reached (defined as $\lambda \leq 0.08 \text{ W}/(\text{mK})$).

Name	Thickness [m]	lambda [W/(mK)]	Q	Thermal capacity [kJ/(kgK)]	Q	Density [kg/m³]	Q	Thermal mass kJ/(m²K)	Criteria Exclusion
End of calculation - Cold									
1	Brick outer leaf & Mortar outer leaf (f = 0.000 / automatic disregarding acc. BRE 4.4.3)	0.1020	0.770	D	0.80	D	1700.0	D	138.7 A, -, C
2	Mineral wool batt - Cavity Batts	0.1000	0.038	D	1.03	D	25.0	D	0.0 A, -, C
3	Dense Natural Aggregate Concrete	0.0150	0.990	E	1.00	E	1800.0	E	27.0 A, -, -
3	Dense Natural Aggregate Concrete	0.0148	0.990	E	1.00	E	1800.0	E	26.6 -, -, -
4	Inhomogeneous material layer consisting of:	0.0425							29.1 -, -, -
4a	Unventilated airspace small: horizontal heat flow	61.95%	0.197	D	1.01	D	1.2	D	0.0 -, -, -
4b	Dense Natural Aggregate Concrete	38.05%	0.990	E	1.00	E	1800.0	E	29.1 -, -, -
5	Dense Natural Aggregate Concrete	0.0298	0.990	E	1.00	E	1800.0	E	53.6 -, -, -
6	Gypsum plastering	0.0130	0.570	D	1.00	D	1300.0	D	16.9 -, -, -
Start of calculation - Warm									
								0.3170	126.1

Heat capacity = 126.1 kJ/(m²K)

The following exclusion criteria apply:

- A .. The total thickness of the layers exceed 0.1 m.
- C .. An insulating layer is reached (defined as $\lambda \leq 0.08 \text{ W}/(\text{mK})$).

Q .. The physical values of the building materials has been graded by their level of quality. These 5 levels are the following

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