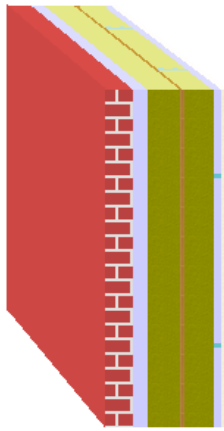
Documentation of the component
Thermal transmittance (U-value) according to Digest 465
Source: **own catalogue - External walls**
Component: **NCNJ2091-Downley Drive-ExtWall rev**

OUTSIDE INSIDE



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.

Assignment: External wall

		Manufacturer	Name	Thickness [m], number	Lambda [W/(mK)]	Q	R [m²K/W]
		Rse					0.0400
☑	1	Generic Building Materials	Brick outer leaf & Mortar outer leaf (f = 0.000 / automatic disregard acc. BRE 443)	0.1020	0.770	D	0.1325
☑	2	BS EN ISO 6946	Unventilated airspace large: horizontal heat flow	0.0500	0.267	D	0.1873
		Airspace: mean temp.: 10°C / deltaT: <5 K / Epsilon1: 0.9 W/(m²K) / Epsilon2: 0.9 W/(m²K)					
☑	3	Rockwool Ltd	Rainscreen Duo-Slab (100-225mm)	0.1100	0.035	B	3.1429
		Fixings	Frame Cramps No./m²:	2.5/m²	17.000	E	-
		Fixings	equivalent diameter: 7.793172E-03 m				
		Air gaps	Level 0: dU'' = 0.00 W/(m²K)				
☑	4	Own catalogue	Sheathing Board	0.0125	0.250	E	0.0500
☑	5	Light steel-frame	consisting of:	0.1000	ø 0.184		0.5438
	5a	Rockwool Ltd	Steel Frame Slab	99.70 %	0.034	B	-
		Air gaps	Level 0: dU'' = 0.00 W/(m²K)				
	5b	BS EN 12524	Steel	00.30 %	50.000	D	-
☑	6	Inhomogeneous material layer	consisting of:	0.0250	ø 0.284		0.0880
	6a	BS EN ISO 6946	Unventilated airspace large: horizontal heat flow	99.70 %	0.000	D	-
		Airspace: mean temp.: 10°C / deltaT: <5 K / Epsilon1: 0.9 W/(m²K) / Epsilon2: 0.9 W/(m²K)					
	6b	BS EN 12524	Steel	00.30 %	50.000	D	-
☑	7	Own catalogue	Standard wallboard plasterboard	0.0125	0.240	E	0.0521
		Rsi					0.1300
				0.4120			

Source: **own catalogue - External walls**
Component: **NCNJ2091-Downley Drive-ExtWall rev**

$R_T = p*R_T' + (1-p)*R_T'' = 5.83$ m²K/W

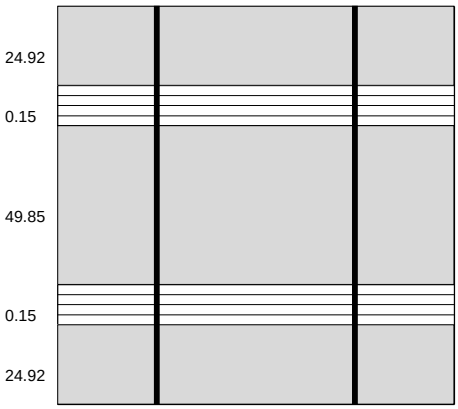
Correction to U-value for	according to	delta U [W/(m²K)]
Mechanical fasteners	Digest 465	0.0086
Air gaps	BS EN ISO 6946 Annex F	0.0000
		0.0086

$U = 1/R_T + \Sigma\Delta U = 0.18$ 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.
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U = **0.18** W/(m²K) R_T= **5.83** m²K/W

Steel percentage: 0.30 %



Light steel-frame, inhomogeneous layer: sections

A	consisting of material layers: 1, 2, 3, 4, 5a, 6a, 7	= 99.40%
B	consisting of material layers: 1, 2, 3, 4, 5b, 6a, 7	= 0.30%
C	consisting of material layers: 1, 2, 3, 4, 5a, 6b, 7	= 0.30%
D	consisting of material layers: 1, 2, 3, 4, 5b, 6b, 7	= 0.00%

Upper limit of the thermal transfer resistance R

U_A [W/(m²K)] = $\frac{1}{(\Sigma R_{i,A}) + R_{si} + R_{se}} = \frac{1}{6.69 + 0.13 + 0.04}$ = 0.15

U_B [W/(m²K)] = $\frac{1}{(\Sigma R_{i,B}) + R_{si} + R_{se}} = \frac{1}{3.75 + 0.13 + 0.04}$ = 0.25

U_C [W/(m²K)] = $\frac{1}{(\Sigma R_{i,C}) + R_{si} + R_{se}} = \frac{1}{6.51 + 0.13 + 0.04}$ = 0.15

U_D [W/(m²K)] = $\frac{1}{(\Sigma R_{i,D}) + R_{si} + R_{se}} = \frac{1}{3.57 + 0.13 + 0.04}$ = 0.27

$$R_T' = \frac{1}{A * U_A + B * U_B + C * U_C + D * U_D} = 6.85\ m^2K/W$$

Lower limit of the thermal transfer resistance R

R_{se} [m²K/W]		= 0.04
R_1 '' [m²K/W] = d_1/λ_1 =	0.1020 / 0.770	= 0.13
R_2 '' [m²K/W] = d_2/λ_2 =	0.0500 / 0.267	= 0.19
R_3 '' [m²K/W] = d_3/λ'_3 =	0.1100 / 0.035	= 3.14
R_4 '' [m²K/W] = d_4/λ_4 =	0.0125 / 0.250	= 0.05
R_5 '' [m²K/W] = $d_5/(\lambda_{5a} * (A + C) + \lambda_{5b} * (B + D))$ =	0.1000 /(0.034 * 99.70% + 50.000 * 0.30%)	= 0.54
R_6 '' [m²K/W] = $d_6/(\lambda_{6a} * (A + B) + \lambda_{6b} * (C + D))$ =	0.0250 /(0.135 * 99.70% + 50.000 * 0.30%)	= 0.09
R_7 '' [m²K/W] = d_7/λ_7 =	0.0125 / 0.240	= 0.05
R_{si} [m²K/W]		= 0.13

$$R_T'' = \Sigma R_i'' + R_{si} + R_{se} = 4.37\ m^2K/W$$

Source: **own catalogue - External walls**
Component: **NCNJ2091-Downley Drive-ExtWall rev**

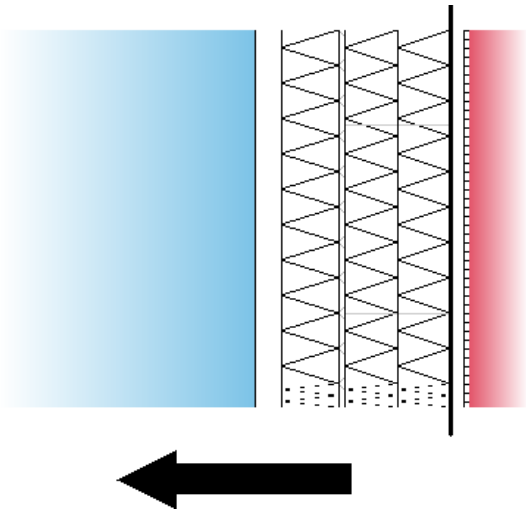
Kind of frame:	Hybrid frame
Flange width:	known not to exceed 50 mm
Stud spacing s [m]:	0.600
Stud depth d [m]:	0.100
Web thickness t [m]:	0.00180
Steel percentage [%]:	0.30

Weight factor p
Formula: $p = 0{,}8 * (R_T''/R_T') + 0{,}32 - 0{,}2 * (0{,}6/s) - 0{,}04 * (d/0{,}1) =$ **0.590**

$$R_T = p*R_T' + (1-p)*R_T'' = 5.83\ m^2K/W$$

Source: **own catalogue - External walls**
Component: **NCNJ2091-Downley Drive-ExtWall rev**

OUTSIDE INSIDE



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 <= 0.08 W/(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 disregard acc. BRE 443)	0.1020	0.770	D	0.80	D	1700.0	D	~~138.7~~	A, -, C
2	Unventilated airspace large: horizontal heat flow	0.0500	0.267	D	1.01	D	1.2	D	~~0.1~~	A, -, C
3	Rainscreen Duo-Slab (100-225mm)	0.1100	0.035	B	1.03	C	60.0	C	~~0.0~~	A, -, C
4	Sheathing Board	0.0125	0.250	E	1.60	E	1000.0	E	~~20.0~~	A, -, C
5	Light steel-frame consisting of:	0.0375							~~0.4~~	A, -, C
5a	Steel Frame Slab	99.70%	0.034	B	1.03	C	35.0	C	~~1.3~~	A, -, C
5b	Steel	00.30%	50.000	D	0.45	D	7800.0	D	~~0.4~~	A, -, C
5	Light steel-frame consisting of:	0.0625							~~0.7~~	-, -, C
5a	Steel Frame Slab	99.70%	0.034	B	1.03	C	35.0	C	~~2.2~~	-, -, C
5b	Steel	00.30%	50.000	D	0.45	D	7800.0	D	0.7	-, -, -
6	Inhomogeneous material layer consisting of:	0.0250							0.3	-, -, -
6a	Unventilated airspace large: horizontal heat flow	99.70%	0.135	D	1.01	D	1.2	D	0.0	-, -, -
6b	Steel	00.30%	50.000	D	0.45	D	7800.0	D	0.3	-, -, -
7	Standard wallboard plasterboard	0.0125	0.240	E	1.00	E	700.0	E	8.8	-, -, -
	Start of calculation - Warm									
		0.4120							**9.0**	

Heat capacity = 9.0 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 <= 0.08 W/(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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