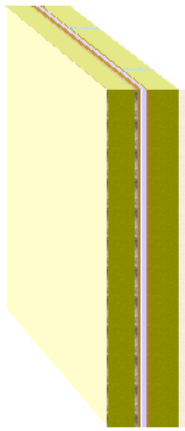
Documentation of the component
Thermal transmittance (U-value) according to Digest 465
Source: **own catalogue - External walls**
Component: **0796-Mayer House- 100 SFS CS2 Render 2**

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
☑	1	Own catalogue	Granol SiliconeTop Coat	0.0015	0.600	E	0.0025
☑	2	Envirowall	Envirorend Basecoat	0.0060	0.610	E	0.0098
☑	3	Own catalogue	Rockwool External Wall Slab DD	0.0900	0.036	E	2.5000
		Air gaps	Level 1: dU" = 0.01 W/(m²K)				
☑	4	Own catalogue	Envirobed Adhesive	0.0100	1.000	E	0.0100
☑	5	JT 2	CS Sheathing Board	0.0120	0.300	E	0.0400
☑	6	BS EN ISO 6946	Unventilated air layer: 15 mm, horiz. heat flow	0.0150	0.088	D	0.1705
☑	7	Own catalogue	Y Wall Board	0.0120	0.300	E	0.0400
☑	8	Light steel-frame	consisting of:	0.1000	ø 0.121		0.8242
	8a	JT 2	Flexi (50-120mm) 600mm wide	99.83 %	0.038	E	-
		Air gaps	Level 1: dU" = 0.01 W/(m²K)				
	8b	BS EN 12524	Steel	00.17 %	50.000	D	-
☑	9	Visqueen Building Products	Visqueen Vapour Barrier	0.0001	0.330	D	0.0004
☑	10	Generic Building Materials	Standard wallboard plasterboard	0.0125	0.210	D	0.0595
☑	11	Generic Building Materials	Standard wallboard plasterboard	0.0125	0.210	D	0.0595
		Rsi					0.1300
				0.2716			

$R_T = p*R_T' + (1-p)*R_T'' = 5.01$ m²K/W

Correction to U-value for	according to	delta U [W/(m²K)]
Air gaps	BS EN ISO 6946 Annex D	~~0.003~~
Air gaps and fixings corrections need not be applied, as their total effect is less than 3% (Annex D BS 6946:1996).		
Rainscreen cladding	BR 443	0.010
		0.010

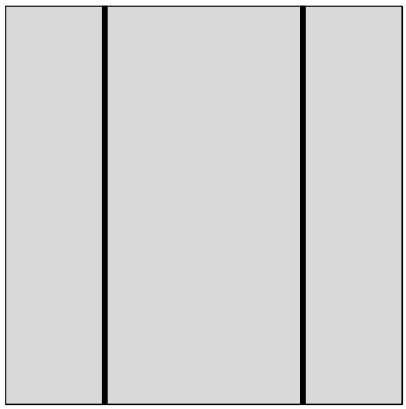
$U = 1/R_T + \Sigma\Delta U = 0.21$ W/(m²K)

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_{max} = 0.30 W/(m²K) U = 0.21 W/(m²K) R_T= 5.01 m²K/W

Source of Umax value: England and Wales Approved Document L1A 2010 Tab 2 Dwellings New

Steel percentage: 0.17 %



Light steel-frame sections
The portion is given in %.

A	consisting of material layers: 1, 2, 3, 4, 5, 6, 7, 8a, 9, 10, 11	= 99.83%
B	consisting of material layers: 1, 2, 3, 4, 5, 6, 7, 8b, 9, 10, 11	= 0.17%

Upper limit of the thermal transfer resistance R

U_A [W/(m²K)] = $\frac{1}{(\Sigma R_{i,A}) + R_{si} + R_{se}}$ = $\frac{1}{5.52 + 0.13 + 0.04}$ = 0.18

U_B [W/(m²K)] = $\frac{1}{(\Sigma R_{i,B}) + R_{si} + R_{se}}$ = $\frac{1}{2.89 + 0.13 + 0.04}$ = 0.33

$$R_T' = \frac{1}{A * U_A + B * U_B} = 5.69\ m^2K/W$$

Lower limit of the thermal transfer resistance R

R_{se} [m²K/W]		= 0.04
R_1'' [m²K/W] = d_1/λ_1=	0.0015 / 0.600	= 0.00
R_2'' [m²K/W] = d_2/λ_2=	0.0060 / 0.610	= 0.01
R_3'' [m²K/W] = d_3/λ_3=	0.0900 / 0.036	= 2.50
R_4'' [m²K/W] = d_4/λ_4=	0.0100 / 1.000	= 0.01
R_5'' [m²K/W] = d_5/λ_5=	0.0120 / 0.300	= 0.04
R_6'' [m²K/W] = d_6/λ_6=	0.0150 / 0.088	= 0.17
R_7'' [m²K/W] = d_7/λ_7=	0.0120 / 0.300	= 0.04
R_8'' [m²K/W] = $d_8/(\lambda_{8a} * A + \lambda_{8b} * B)$ =	0.1000 /(0.038 * 99.83% + 50.000 * 0.17%)	= 0.82
R_9'' [m²K/W] = d_9/λ_9=	0.0001 / 0.330	= 0.00
R_{10}'' [m²K/W] = d_{10}/λ_{10}=	0.0125 / 0.210	= 0.06
R_{11}'' [m²K/W] = d_{11}/λ_{11}=	0.0125 / 0.210	= 0.06
R_{si} [m²K/W]		= 0.13

$$R_T'' = \Sigma R_i'' + R_{si} + R_{se} = 3.89\ m^2K/W$$

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]:	0.00100
Steel percentage [%]:	0.17

Weight factor p
Formula: $p = 0{,}8 * (R_T''/R_T') + 0{,}32 - 0{,}2 * (0{,}6/s) - 0{,}04 * (d/0{,}1) =$ **0.627**

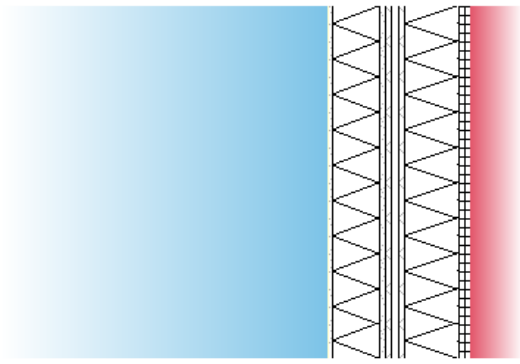
$$R_T = p*R_T' + (1-p)*R_T'' = 5.01\ m^2K/W$$

Correction according to BR 443 Rainscreen cladding

User defined input - Pointloss:

Name	Pointloss Chi [W/K]	Ref. quantity [-]	Ref. area [m²]	delta U [W/(m²K)]
Fischer FabS Termoz Washer	0.001	10.00	1.00	0.010
				0.010

OUTSIDE INSIDE



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

This calculation of the Condensation risk analysis according to BS EN ISO 13788:2002 has been performed on a construction containing inhomogeneous layers. This calculation is only valid through the selected section. It is advisable that you should also select the alternative position and recalculate the Condensation Risk Analysis for a more complete assessment of the construction.

Assignment: External wall

Name	Thickn. [m]	lambda [W/(mK)]	Q	μ [-]	Q	sd [m]	R [m²K/W]
Granol SiliconeTop Coat	0.0015	0.600	E	53.00	E	0.08	0.0025
Envirorend Basecoat	0.0060	0.610	E	15.00	E	0.09	0.0098
Rockwool External Wall Slab DD	0.0900	0.036	E	1.00	E	0.09	2.5000
Envirobed Adhesive	0.0100	1.000	E	6.00	E	0.06	0.0100
CS Sheathing Board	0.0120	0.300	E	30.00	E	0.36	0.0400
Unventilated air layer: 15 mm, horiz. heat flow	0.0150	0.088	D	1.00	D	0.02	0.1705
Y Wall Board	0.0120	0.300	E	30.00	E	0.36	0.0400
Flexi (50-120mm) 600mm wide	0.1000	0.038	E	1.00	E	0.10	2.6316
Visqueen Vapour Barrier	0.0001	0.330	D	333333.0 0	D	40.00	0.0004
Standard wallboard plasterboard	0.0125	0.210	D	4.00	D	0.05	0.0595
Standard wallboard plasterboard	0.0125	0.210	D	4.00	D	0.05	0.0595

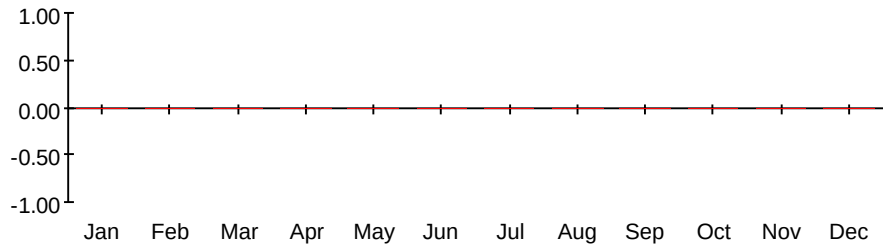
Q .. The physical values of the building materials has been graded by their level of quality. These 5 levels are the following
A .. A: Data is entered and validated by the manufacturer or supplier. Data is continuously tested by 3rd party.
B .. B: Data is entered and validated by the manufacturer or 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.

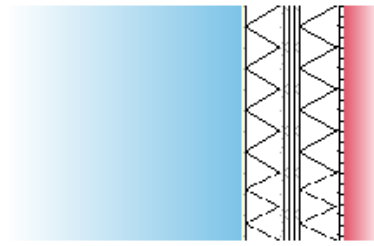
Condensation risk analysis - summary of main results
Calculation according BS EN ISO 13788

Surface temperature to avoid critical surface moisture:
No danger of mould growth is expected.

Interstitial condensation:
No condensation is predicted at any interface in any month.

Interstitial condensation and evaporation per month gc [g/m²]





Component, condensation range

CRA calculations according to BS EN ISO 13788:2002 are used as a guide in predicting interstitial condensation. This methodology uses some simplifications of the dynamic processes involved and subsequently does have some limitations. Further information can be found in Information Paper IP 2/05 'Modelling and controlling interstitial condensation in buildings" Feb 2005.

Surface temperature to avoid critical surface humidity
Calculation according BS EN ISO 13788

Location: London (Heathrow); Humidity class according BS EN ISO 13788 annex A: Dwellings with high occupancy

		1	2	3	4	5	6	7	8	9	10	11	12
	Month	Te	phi_e	Ti	phi_i	pe	delta p	pi	ps(Tsi)	Tsi,min	fRsi	Tsi	Tse
		[°C]	---	[°C]	---	[Pa]	[Pa]	[Pa]	[Pa]	[°C]	---	[°C]	[°C]
I	January	4.9	0.840	20.0	0.695	727	897	1624	2030	17.7	0.851	19.4	5.0
	February	4.7	0.820	20.0	0.688	700	909	1609	2011	17.6	0.843	19.3	4.8
	March	6.9	0.770	20.0	0.661	766	778	1544	1930	16.9	0.767	19.4	7.0
	April	8.8	0.710	20.0	0.629	804	665	1469	1836	16.2	0.657	19.5	8.9
	May	12.6	0.690	20.0	0.619	1006	440	1446	1807	15.9	0.448	19.7	12.7
	June	15.7	0.690	20.0	0.636	1230	255	1486	1857	16.3	0.148	19.8	15.7
	July	17.9	0.680	20.0	0.650	1394	125	1519	1898	16.7	-0.579	19.9	17.9
	August	17.6	0.700	20.0	0.664	1408	143	1551	1938	17.0	-0.244	19.9	17.6
	September	14.9	0.750	20.0	0.673	1270	303	1573	1966	17.2	0.459	19.8	14.9
	October	11.2	0.810	20.0	0.685	1077	523	1600	2000	17.5	0.717	19.6	11.3
	November	7.6	0.840	20.0	0.690	876	737	1613	2016	17.6	0.809	19.5	7.7
	December	5.9	0.860	20.0	0.700	798	838	1636	2045	17.9	0.848	19.4	6.0

- The critical month is January with $f_{Rsi,max}$ = 0.851
  f_{Rsi} = 0.957

$f_{Rsi} > f_{Rsi,max}$, the component complies.

Nr Explanation

1 External temperature
2 External rel. humidity
3 Internal temperature
4 Internal relative humidity
5 External partial pressure $p_e = \phi_e * p_{sat}(T_e)$; $p_{sat}(T_e)$ according formula E.7 and E.8 of BS EN ISO 13788
6 Partial pressure difference. The security factor of 1.10 according to BS EN ISO 13788, ch.4.2.4 is already included.
7 Internal partial pressure $p_i = \phi_i * p_{sat}(T_i)$; $p_{sat}(T_i)$ according formula E.7 and E.8 of BS EN ISO 13788
8 Minimum saturation pressure on the surface obtained by $p_{sat}(T_{si}) = p_i / \phi_{si}$,
where ϕ_{si} = 0.8 (critical surface humidity)
9 Minimum surface temperature as function of $p_{sat}(T_{si})$, formula E.9 and E.10 of BS EN ISO 13788
10 Design temperature factor according 3.1.2 of BS EN ISO 13788
11 Internal surface temperature, obtained from $T_{si} = T_i - R_{si} * U * (T_i - T_e)$
12 External surface temperature, obtained from $T_{se} = T_e + R_{se} * U * (T_i - T_e)$

Interstitial condensation - main results
Calculation according BS EN ISO 13788

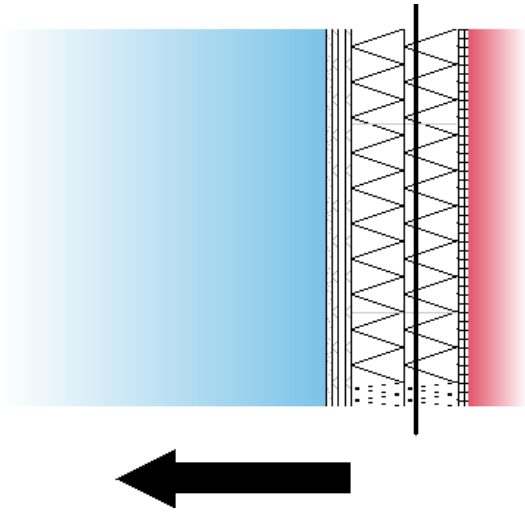
No condensation is predicted at any interface in any month.

Climcatic conditions
Location: London (Heathrow); Humidity class according BS EN ISO 13788 annex A: Dwellings with high occupancy

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Internal temperature [°C]	Ti	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Internal rel. humidity [%]	phi_i	69.5	68.8	66.1	62.9	61.9	63.6	65.0	66.4	67.3	68.5	69.0	70.0
External temperature [°C]	Te	4.9	4.7	6.9	8.8	12.6	15.7	17.9	17.6	14.9	11.2	7.6	5.9
External rel. humidity [%]	phi_e	84.0	82.0	77.0	71.0	69.0	69.0	68.0	70.0	75.0	81.0	84.0	86.0

Source: **own catalogue - External walls**
Component: **0796-Mayer House- 100 SFS CS2 Render 2**

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	Granol SiliconeTop Coat	0.0015	0.600	E	1.00	E	1800.0	E	~~2.7~~	A, -, C
2	Envirorend Basecoat	0.0060	0.610	E	1.00	E	1690.0	E	~~10.1~~	A, -, C
3	Rockwool External Wall Slab DD	0.0900	0.036	E	1.03	E	140.0	E	~~0.0~~	A, -, C
4	Envirobed Adhesive	0.0100	1.000	E	1.00	E	1800.0	E	~~18.0~~	A, -, C
5	CS Sheathing Board	0.0120	0.300	E	1.50	E	1200.0	E	~~21.6~~	A, -, C
6	Unventilated air layer: 15 mm, horiz. heat flow	0.0150	0.088	D	1.01	D	1.2	D	~~0.0~~	A, -, C
7	Y Wall Board	0.0120	0.300	E	1.50	E	1250.0	E	~~22.5~~	A, -, C
8	Light steel-frame consisting of:	0.0251							~~0.1~~	A, -, C
8a	Flexi (50-120mm) 600mm wide	99.83%	0.038	E	1.03	E	35.0	E	~~0.9~~	A, -, C
8b	Steel	00.17%	50.000	D	0.45	D	7800.0	D	~~0.1~~	A, -, C
8	Light steel-frame consisting of:	0.0749							0.4	-, -, -
8a	Flexi (50-120mm) 600mm wide	99.83%	0.038	E	1.03	E	35.0	E	~~2.7~~	-, -, C
8b	Steel	00.17%	50.000	D	0.45	D	7800.0	D	0.4	-, -, -
9	Visqueen Vapour Barrier	0.0001	0.330	D	2.20	D	920.0	D	0.2	-, -, -
10	Standard wallboard plasterboard	0.0125	0.210	D	1.00	D	700.0	D	8.8	-, -, -
11	Standard wallboard plasterboard	0.0125	0.210	D	1.00	D	700.0	D	8.8	-, -, -
	Start of calculation - Warm									
		0.2716							**18.2**	

Heat capacity = 18.2 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
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.