Documentation of the component
Thermal transmittance (U-value) according to BS EN ISO 6946
Source: **Own Catalogue - Flat roofs**
Component: **R_PB_SIP150_EPDM u18**

SuperSIPs
Thermal Assessment

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Assignment: Flat roof

		Manufacturer	Name	Thickness [m], number	Lambda [W/(mK)]	Q	R [m²K/W]
		Rse					0.0400
☑	1	BS EN 12524	Ethylene propylene diene monomer (EPDM)	0.0030	0.250	D	0.0120
☑	2	BS EN 12524	Oriented strand board (OSB)	0.0110	0.130	D	0.0846
☑	3	Elastogran	PU Foam 128	0.1280	0.025	E	5.1200
☑	4	BS EN 12524	Oriented strand board (OSB)	0.0110	0.130	D	0.0846
☑	5	TYVEK	Tyvek SD2 ALB/VCL	0.0003	0.100	C	0.0025
☑	6	Generic Building Materials	Acoustic or fire resistant plasterboard	0.0125	0.250	D	0.0500
☑	7	Generic Building Materials	Acoustic or fire resistant plasterboard	0.0125	0.250	D	0.0500
		Rsi					0.1000
				0.1783			

$R_T = R_{si} + \Sigma R_i + R_{se} = 5.54$ m²K/W

$U = 1/R_T = 0.18$ 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.
B .. B: Data is entered and validated by the manufacturer or supplier. Data is certified by 3rd party
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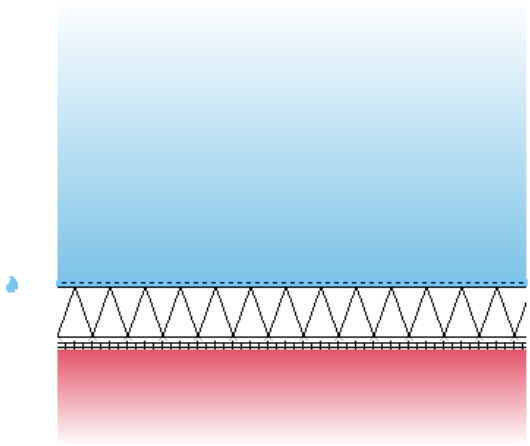
U_{max} = 0.20 W/(m²K) U = 0.18 W/(m²K) R_T= 5.54 m²K/W

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

OUTSIDE



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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.

Assignment: Flat roof

Name	Thickn. [m]	lambda [W/(mK)]	Q	μ [-]	Q	sd [m]	R [m²K/W]
Ethylene propylene diene monomer (EPDM)	0.0030	0.250	D	6000.00	D	18.00	0.0120
Oriented strand board (OSB)	0.0110	0.130	D	30.00	D	0.33	0.0846
PU Foam 128	0.1280	0.025	E	50.00	E	6.40	5.1200
Oriented strand board (OSB)	0.0110	0.130	D	30.00	D	0.33	0.0846
Tyvek SD2 ALB/VCL	0.0003	0.100	C	8000.00	C	2.00	0.0025
Acoustic or fire resistant plasterboard	0.0125	0.250	D	4.00	D	0.05	0.0500
Acoustic or fire resistant plasterboard	0.0125	0.250	D	4.00	D	0.05	0.0500

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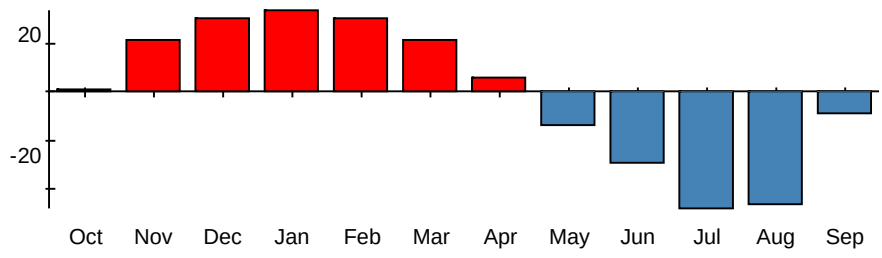
Condensation risk analysis - summary of main results
Calculation according BS EN ISO 13788

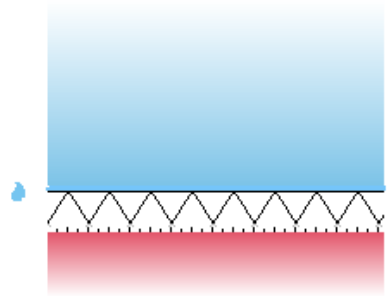
Surface temperature to avoid critical surface moisture:
No danger of mould growth is expected.

Interstitial condensation occurs, but all the condensate is predicted to evaporate during the summer months.

The risk of degradation of building materials and deterioration of thermal performance as a consequence of the calculated maximum amount of moisture shall be considered according to regulatory requirements and other guidance in product standards.

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





Component, condensation range

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

Location: Upper Heyford; Humidity class according BS EN ISO 13788 annex A: Dwellings with low occupancy

		1	2	3	4	5	6	7	8	9	10	11	12
	Month	Te [°C]	phi_e ---	Ti [°C]	phi_i ---	pe [Pa]	delta p [Pa]	pi [Pa]	ps(Tsi) [Pa]	Tsi,min [°C]	fRsi ---	Tsi [°C]	Tse [°C]
I	January	4.1	0.810	20.0	0.587	663	708	1371	1714	15.1	0.691	19.3	4.2
	February	3.8	0.790	20.0	0.580	633	722	1355	1694	14.9	0.685	19.3	3.9
	March	5.8	0.770	20.0	0.574	710	633	1342	1678	14.8	0.631	19.4	5.9
	April	7.7	0.720	20.0	0.558	756	548	1304	1630	14.3	0.538	19.5	7.8
	May	11.1	0.720	20.0	0.577	951	396	1347	1684	14.8	0.418	19.6	11.2
	June	14.0	0.720	20.0	0.607	1150	267	1418	1772	15.6	0.268	19.7	14.0
	July	16.4	0.710	20.0	0.635	1324	160	1484	1855	16.3	-0.022	19.8	16.4
	August	16.2	0.710	20.0	0.632	1307	169	1476	1845	16.2	0.010	19.8	16.2
	September	13.9	0.750	20.0	0.626	1191	272	1462	1828	16.1	0.359	19.7	13.9
	October	10.4	0.790	20.0	0.609	996	428	1424	1779	15.7	0.549	19.6	10.5
	November	6.8	0.820	20.0	0.598	810	588	1398	1747	15.4	0.651	19.4	6.9
	December	5.1	0.820	20.0	0.592	720	664	1384	1730	15.2	0.680	19.3	5.2

- The critical month is January with $f_{Rsi,max}$ = 0.691
  f_{Rsi} = 0.956

$f_{Rsi} > f_{Rsi,max}$, 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

Interstitial condensation occurs but all the condensate is predicted to evaporate during the summer months.

The risk of degradation of building materials and deterioration of thermal performance as a consequence of the calculated maximum amount of moisture shall be considered according requirements and other guidance in product standards.

Climcatic conditions
Location: Upper Heyford; Humidity class according BS EN ISO 13788 annex A: Dwellings with low 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	58.7	58.0	57.4	55.8	57.7	60.7	63.5	63.2	62.6	60.9	59.8	59.2
External temperature [°C]	Te	4.1	3.8	5.8	7.7	11.1	14.0	16.4	16.2	13.9	10.4	6.8	5.1
External rel. humidity [%]	phi_e	81.0	79.0	77.0	72.0	72.0	72.0	71.0	71.0	75.0	79.0	82.0	82.0

Monthly moisture content per area gc [g/m²]
Accumulated moisture content per area Ma [g/m²]

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Ethylene propylene diene monomer (EPDM) / Oriented strand board (OSB)	gc	1	16	17	18	16	16	12	8	-20	-39	-38	-7
	Ma	1	17	34	52	67	83	95	103	83	44	6	---
Oriented strand board (OSB) / PU Foam 128	gc	---	2	7	10	9	2	-7	-19	-3	---	---	---
	Ma	---	2	9	18	27	29	22	3	---	---	---	---

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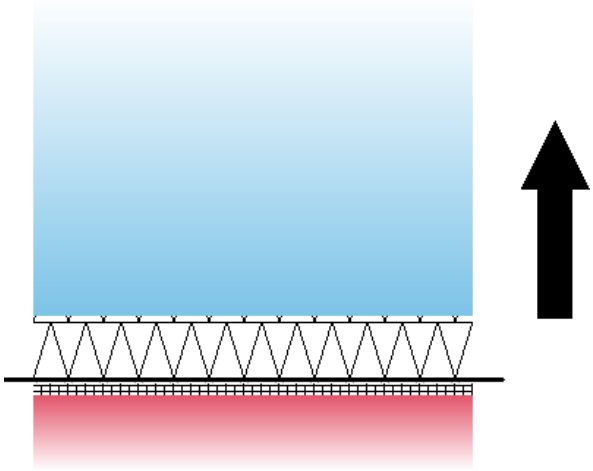

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The list of materials shown below may differ from those in the U-value calculation printout. Only material layers which are used in the heat capacity calculation are listed.

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	Ethylene propylene diene monomer (EPDM)	0.0030	0.250	D	1.00	D	1150.0	D	~~3.5~~	-, B, C
2	Oriented strand board (OSB)	0.0110	0.130	D	1.70	D	650.0	D	~~12.2~~	-, B, C
3	PU Foam 128	0.0751	0.025	E	1.70	E	45.0	E	~~0.0~~	-, B, C
3	PU Foam 128	0.0529	0.025	E	1.70	E	45.0	E	~~0.0~~	-, -, C
4	Oriented strand board (OSB)	0.0110	0.130	D	1.70	D	650.0	D	12.2	-, -, -
5	Tyvek SD2 ALB/VCL	0.0003	0.100	C	1.70	C	432.0	C	0.2	-, -, -
6	Acoustic or fire resistant plasterboard	0.0125	0.250	D	1.00	D	900.0	D	11.3	-, -, -
7	Acoustic or fire resistant plasterboard	0.0125	0.250	D	1.00	D	900.0	D	11.3	-, -, -
	Start of calculation - Warm									
		0.1783							**34.8**	

Heat capacity = 34.8 kJ/(m²K)

The following exclusion criteria apply:
B .. The mid point in the construction is reached.
C .. An insulating layer is reached (defined as lambda <= 0.08 W/(mK)).

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