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DESIGN DATA SHEET 002

5424 – St KATHERINE'S HOUSE

FLAT AND PITCHED ROOF U VALUES

0.15 W/m²K U VALUE – FLAT ROOF



U-Value Calculation and Condensation Risk Assessment

Project Information St Catherines House, Shorne, Gravesend
 Construction: Cold Flat Roof
 Construction Type: Flat Roof
 File reference: 1-JS-241125-151509-797
 Calculated U-value = 0.15W/m²K

Selected Build-Up

Description	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m ² K/W)	Thermal Bridging	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)	
Inside Surface			0.100				
PLASTER SKIM	3.0	0.180	0.017		60.000	0.180	
PLASTERBOARD	18.0	0.190	0.095		50.000	0.900	
TIMBER BATTEN CAVITY; U/V.	25.0		0.166	12.7% roof timber - 47mm @ 400mm ctrs + 1% for noggins + loft hatches		0.050	1
1000 GAUGE 0.25mm POLYTHENE VAPOUR CONTROL LAYER	0.3		0.001			500.000	
KOOLTHERM K107	50.0	0.019	2.632			22.900	
KOOLTHERM K107	100.0	0.019	4.690	12.7% roof timber - 47mm @ 400mm ctrs + 1% for noggins + loft hatches		37.700	
VENTILATED RAFTER/JOIST CAVITY	50.0		0.000			0.000	
PLYWOOD DECKING	18.0	0.140	0.000		520.000	9.360	
LEAD SHEETING	2.0	34.760	0.000			10.000	2
Outside Surface			0.172				

Key Bridged and fastened Bridged Fastened

Supporting Information

1. Service void
2. on suitable underlay

Detailed U-value

The calculation method is in accordance with BS EN ISO 6946:2017 / I.S. EN ISO 6946:2017. A simplified summary of the steps involved are shown below

$$R_{total}(R_{tot}) = R_{si} + R_1 + R_2 + \dots + R_n + R_{se}$$

For a construction containing inhomogeneous layers the upper and lower resistances of the construction must be used

$$R_{tot;upper} = 1 / ((f_a / R_{tot;a}) + (f_b / R_{tot;b}) + \dots + (f_q / R_{tot;q}))$$

$$R_j = 1 / ((f_a / R_{aj}) + (f_b / R_{bj}) + \dots + (f_q / R_{aj}))$$

$$R_{tot;lower} = R_{si} + R_1 + R_2 + R_j + \dots + R_n + R_{se}$$

$$\begin{aligned} R_{tot} &= (R_{tot;upper} + R_{tot;lower}) / 2 \\ &= (7.384 + 6.198) / 2 \end{aligned}$$

$$\begin{aligned} U &= 1 / R_{tot} \\ &= 6.791 \end{aligned}$$

$$\Delta U = \Delta U_g + \Delta U_f + \Delta U_r$$

ΔU_g correction for air voids - 0.0000

ΔU_f correction for fasteners by approximate procedure - 0.0000

ΔU_f correction for fasteners by detailed calculation method (rainscreen cladding) - 0.0000
(point thermal transmittance 0.000 W/K | fasteners per m² 0.000)

ΔU_r correction for inverted roofs - 0.0000
(precipitation 0.000 mm/day | f• x 0.0000)

Total U-value (U_c) = $U + \Delta U$

If ΔU is less than 3% of U then the corrections need not be applied.

Calculations including a steel frame construction are calculated in accordance with BRE Digest 465.

Condensation

Condensation calculations have been performed in accordance with BS EN ISO 13788:2012 and BS 5250:2021 and the risk assessed within environmental conditions with the following characteristics

Humidity class 2 - Offices, shops and dwellings with low occupancy

Location: 5a England SE & Central South

Condensation risk has been assessed up to and including Level 2 Humidity Class (2 - Offices, shops and dwellings with low occupancy) within worst case environment conditions. The risk level is 1 in 20 years

Condensation Analysis

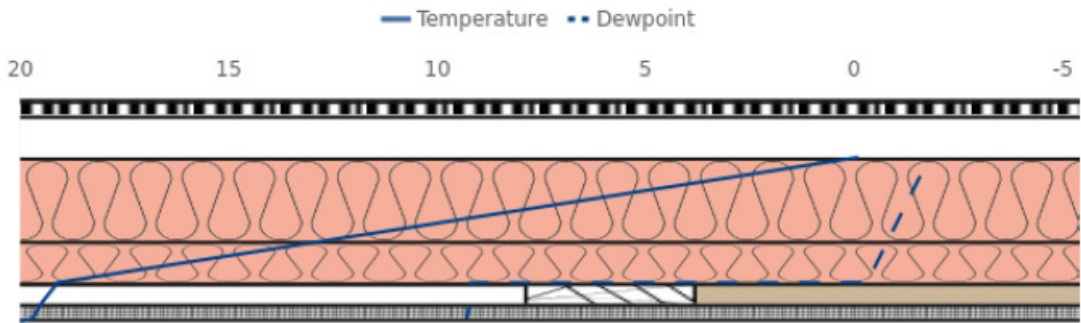
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Internal Temperature (°C)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Internal Relative Humidity (%)	49.9	49.6	50.2	50.9	54.4	58.5	62.8	63.2	60.4	56.6	52.4	51.3
External Temperature (°C)	-0.5	-0.2	1.7	4.0	7.3	10.4	12.5	12.1	9.8	6.7	2.4	0.5
External Relative Humidity (%)	90.0	86.5	84.0	81.0	81.0	80.0	80.5	82.5	85.5	88.0	89.5	90.5

Gc = Monthly moisture accumulation per area at an interface

Ma = Accumulated moisture content per area at an interface

Peak accumulated moisture content per area at all interfaces (Ma) = 0.000 Kg/m²

Annual moisture accumulation (Ma) = 0.000 Kg/m²



0.15 W/m²K U VALUE – PITCHED ROOF



U-Value Calculation and Condensation Risk Assessment

Project Information St Catherines House, Shorne, Gravesend
 Construction: Pitched roof – Ventilated
 Construction Type: Pitched Roof
 File reference: 1-JS-241125-152246-799
 Calculated U-value = 0.15W/m²K

Selected Build-Up

Description	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m ² K/W)	Thermal Bridging	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)	
Inside Surface			0.100				
PLASTER SKIM	3.0	0.180	0.017		60.000	0.180	
PLASTERBOARD	18.0	0.190	0.095		50.000	0.900	
TIMBER BATTEN CAVITY; U/V.	25.0		0.172	12.7% roof timber - 47mm @ 400mm ctrs + 1% for noggins + loft hatches		0.050	1
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KOOLTHERM K107	50.0	0.019	2.632			22.900	2
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VENTILATED RAFTER/JOIST CAVITY	50.0		0.000			0.000	
PLYWOOD DECKING	18.0	0.140	0.000		520.000	9.360	
LEAD SHEETING	2.0	34.760	0.000			10.000	3
Outside Surface			0.172				

Key Bridged and fastened Bridged Fastened

Supporting Information

1. Service void
2. Continuous layer
3. on suitable underlay

Detailed U-value

The calculation method is in accordance with BS EN ISO 6946:2017 / I.S. EN ISO 6946:2017. A simplified summary of the steps involved are shown below

$$R_{total}(R_{tot}) = R_{si} + R_1 + R_2 + \dots + R_n + R_{se}$$

For a construction containing inhomogeneous layers the upper and lower resistances of the construction must be used

$$R_{tot;upper} = 1 / ((f_a / R_{tot;a}) + (f_b / R_{tot;b}) + \dots + (f_q / R_{tot;q}))$$

$$R_j = 1 / ((f_a / R_{aj}) + (f_b / R_{bj}) + \dots + (f_q / R_{qj}))$$

$$R_{tot;lower} = R_{si} + R_1 + R_2 + R_j + \dots + R_n + R_{se}$$

$$R_{tot} = (R_{tot;upper} + R_{tot;lower}) / 2$$

$$= (7.389 + 6.204) / 2$$

$$U = 1 / R_{tot}$$

$$= 6.797$$

$$\Delta U = \Delta U_g + \Delta U_f + \Delta U_r$$

ΔU_g correction for air voids - 0.0000

ΔU_f correction for fasteners by approximate procedure - 0.0000

ΔU_f correction for fasteners by detailed calculation method (rainscreen cladding) - 0.0000
(point thermal transmittance 0.000 W/K | fasteners per m² 0.000)

ΔU_r correction for inverted roofs - 0.0000
(precipitation 0.000 mm/day | $f_{\bullet}$ x 0.0000)

Total U-value (U_c) = $U + \Delta U$

If ΔU is less than 3% of U then the corrections need not be applied.

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Condensation Analysis

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Internal Temperature (°C)	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 Relative Humidity (%)	49.9	49.6	50.2	50.9	54.4	58.5	62.8	63.2	60.4	56.6	52.4	51.3
External Temperature (°C)	-0.5	-0.2	1.7	4.0	7.3	10.4	12.5	12.1	9.8	6.7	2.4	0.5
External Relative Humidity (%)	90.0	86.5	84.0	81.0	81.0	80.0	80.5	82.5	85.5	88.0	89.5	90.5

Gc = Monthly moisture accumulation per area at an interface

Ma = Accumulated moisture content per area at an interface

Peak accumulated moisture content per area at all interfaces (Ma) = 0.000 Kg/m²

Annual moisture accumulation (Ma) = 0.000 Kg/m²

