

Project Information

Reference B244749
Date 7 April 2025
Project King Street, 48

Construction Type

Element : Flat roof - Roof 1

Internal surface emissivity	: High	External surface emissivity	: High		
		Thickness	Thermal Conductivity	Thermal Resistance	Pitch Bridge details
		(mm)	(W/mK)	(m ² K/W)	(°) Air gaps (Level, Delta U")
Outside surface resistance		-	-	0.040	
Bauder K5K Capping Sheet		5.2	0.230	0.023	
Bauder KSA DUO Underlayer		3.0	0.230	0.013	
BauderPIR FA-TE Flatboard Insulation		140.0	0.022	6.364	L:0 0.000W/m ² K
BauderTEC KSD FBS Air & Vapour Control Layer		2.5	0.230	0.011	
Plywood (700 kg/m ³)		18.0	0.170	0.106	
Cavity Between Joists@400 Centres		300.0	-	0.160	12.500% Timber (300.0mm)
Asphalt		20.0	0.700	0.029	
Concrete screed		10.0	1.149	0.009	
Woodwool slabs		50.0	0.100	0.500	
Inside surface resistance		-	-	0.100	

Total thickness 548.7mm

U-value = 0.13W/m²K

U-value, Combined Method : 0.134W/m²K (upper/lower limit 7.568 / 7.375m²K/W, dUf 0.0000, dUg 0.0000, dUp 0.0000, dUr 0.0000, dUrc1 0.0000, dUrc2 0.0000)

Correction factors

Air gaps, Delta Ug = 0.000W/m²K

(Based on the combined method for determining U-values of structures containing repeating thermal bridges)

	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m ² K/W)	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)
Outside surface resistance	-	-	0.040	-	-
Bauder K5K Capping Sheet	5.2	0.230	0.023	250000	1300.00
Bauder KSA DUO Underlayer	3.0	0.230	0.013	250000	750.00
BauderPIR FA-TE Flatboard Insulation	140.0	0.022	6.364	390.00	54.60
BauderTEC KSD FBS Air & Vapour Control Layer	2.5	0.230	0.011	0.00	7500.00
Plywood (700 kg/m ³)	18.0	0.170	0.106	1100.00	19.80
Cavity Between Joists@400 Centres	300.0	-	0.160	-	0.00
Asphalt	20.0	0.700	0.029	250000	5000.00
Concrete screed	10.0	1.149	0.009	500.00	5.00
Woodwool slabs	50.0	0.100	0.500	27.00	1.35
Inside surface resistance	-	-	0.100	-	-
Total thickness	548.7mm				

Advice from BS 5250:2021 regarding acceptable levels of condensate: "In flat roofs with a continuously supported waterproof covering the maximum predicted amount of condensate should not exceed 350g/m² and any condensate should dry out during the course of the year so as to avoid year on year accumulation". Organic materials should not be exposed to harmful and prolonged condensation. Whilst the information contained herein is to the best of our knowledge true and accurate we specifically exclude any liability for errors, omissions or otherwise arising therefrom. Details, practices, principles, values and calculations should be verified for accuracy and suitability for the required purpose for use.

Detailed U-value Calculation Results

Construction includes 1 bridged layer

Non-bridged layers

Outside surface resistance	0.040 m ² K/W
Bauder K5K Capping Sheet	0.023 m ² K/W
Bauder KSA DUO Underlayer	0.013 m ² K/W
BauderPIR FA-TE Flatboard Insulation	6.364 m ² K/W
BauderTEC KSD FBS Air & Vapour Control Layer	0.011 m ² K/W
Plywood (700 kg/m ³)	0.106 m ² K/W
Asphalt	0.029 m ² K/W
Concrete screed	0.009 m ² K/W
Woodwool slabs	0.500 m ² K/W
Inside surface resistance	0.100 m ² K/W
<u>Resistance of non-bridged layers, R_{NB} =</u>	<u>7.194 m²K/W</u>

Bridged layer

Cavity Between Joists@400 Centres (L1) bridged by Timber (B1)

Path 1 - Cavity Bet

Path 2 - Timber

Resistance and fraction of heat flow paths

$$R_{P1} = R_{NB} + R_{L1} = 7.194 + 0.160 = 7.354 \text{ m}^2\text{K/W} \quad F_{P1} = 87.500\%$$

$$R_{P2} = R_{NB} + R_{L2} = 7.194 + 2.308 = 9.502 \text{ m}^2\text{K/W} \quad F_{P2} = 12.500\%$$

Upper resistance limit

$$R_{upper} = 1 / ((F_{P1}/R_{P1}) + (F_{P2}/R_{P2}))$$

$$R_{upper} = 1 / ((0.875/7.354) + (0.125/9.502)) = 7.568 \text{ m}^2\text{K/W}$$

Lower resistance limit

$$R_{lower} = R_{NB} + 1 / ((F_{L1}/R_{L1}) + (F_{B1}/R_{B1}))$$

$$R_{lower} = 7.194 + 1 / ((0.875/0.160) + (0.125/2.308)) = 7.375 \text{ m}^2\text{K/W}$$

Total resistance of roof

$$R_T = (R_{upper} + R_{lower}) / 2 = (7.568 + 7.375) / 2 = 7.47 \text{ m}^2\text{K/W}$$

Correction for air gaps, Delta Ug = 0.0000W/m²K

(Delta Uf + Delta Ug + Delta Up + Delta Ur) is less than 3% of (1 / Rt) so U = (1 / Rt) + (Delta Ur) + (Delta Urc) = 0.13 W/m²K

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Structure element : Flat roof

Condensation calculations performed in accordance with BS5250:2021

Condensation is occurring at the following layers interfaces:-

Interface 1 : Bauder KSA DUO Underlayer / BauderPIR FA-TE Flatboard Insulation

Month	Int (C°)	Int (%RH)	Ext (C°)	Ext (%RH)	Interface 1 Gc (Kg/m²)	Ma (Kg/m²)
Jan	20.00	68.10	-5.00	87.00	0.00025	0.00028
Feb	20.00	67.50	-5.00	85.00	0.00022	0.00050
Mar	20.00	65.80	4.70	80.50	-0.00009	0.00041
Apr	20.00	64.90	6.90	78.00	-0.00018	0.00023
May	20.00	65.10	10.30	75.50	-0.00036	0.00000
Jun	20.00	68.80	13.20	77.50	0.00000	0.00000
Jul	20.00	72.40	14.80	79.50	0.00000	0.00000
Aug	20.00	73.00	14.70	80.50	0.00000	0.00000
Sep	20.00	71.10	12.50	82.50	0.00000	0.00000
Oct	20.00	69.50	9.60	85.00	0.00000	0.00000
Nov	20.00	68.10	5.30	86.50	0.00000	0.00000
Dec	20.00	68.30	3.50	87.50	0.00003	0.00003

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 interface (Ma) = 0.00050 Kg/m²

Annual moisture accumulation = 0.00000 Kg/m²

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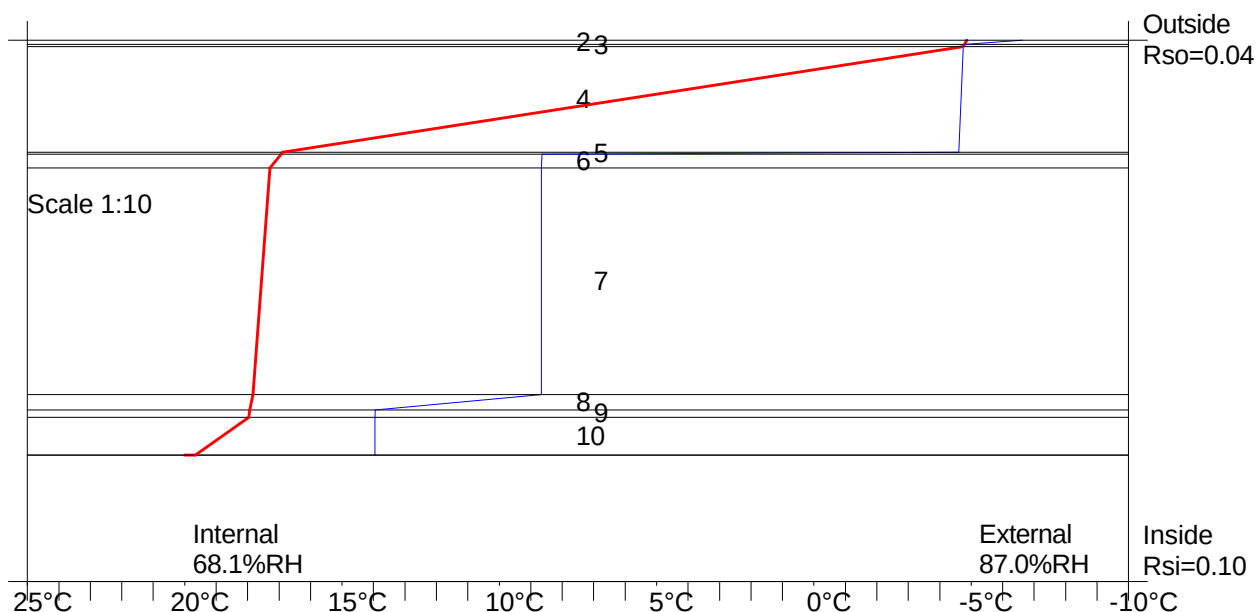
Condensation Risk Analysis (no account taken of thermal bridges)

4 - Sports halls, kitchens, canteens, school classrooms, hospitals and buildings with unflued gas heaters

Jan (worst)	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec												
20.0C	68.1%	20.0C	67.5%	20.0C	65.8%	20.0C	64.9%	20.0C	65.1%	20.0C	68.8%	20.0C	72.4%	20.0C	73.0%	20.0C	71.1%	20.0C	69.5%	20.0C	68.1%	20.0C	68.3%
-5.0C	87.0%	-5.0C	85.0%	4.7C	80.5%	6.9C	78.0%	10.3C	75.5%	13.2C	77.5%	14.8C	79.5%	14.7C	80.5%	12.5C	82.5%	9.6C	85.0%	5.3C	86.5%	3.5C	87.5%

	Interface Temp. °C	Dewpoint Temp. °C	Vapour Pressure (kPa)	Saturated V.P. (kPa)	Worst Cond. (g/m²)	Peak Buildup (g/m²)	Condensation
1 Outside surface resistance							
2 Bauder K5K Capping Sheet	-4.9	-6.6	0.35	0.41			No
3 Bauder KSA DUO Underlayer	-4.8	-4.8	0.41	0.41			No
4 BauderPIR FA-TE Flatboard Insulation	-4.7	-4.7	0.41	0.41	0.2 in Jan	0 in Feb	Yes
5 BauderTEC KSD FBS Air & Vapour Control Layer	16.9	-4.6	0.42	1.92			No
6 Plywood (700 kg/m³)	16.9	8.6	1.12	1.93			No
7 Cavity Between Joists@400 Centres	17.3	8.7	1.12	1.97			No
8 Asphalt	17.8	8.7	1.12	2.04			No
9 Concrete screed	17.9	13.9	1.59	2.05			No
10 Woodwool slabs	18.0	14.0	1.59	2.06			No
11 Inside surface resistance	19.7	14.0	1.59	2.29			No

Worst case internal / external conditions for graph : 20.0°C @ 68.1%RH / -5.0°C @ 87.0%RH



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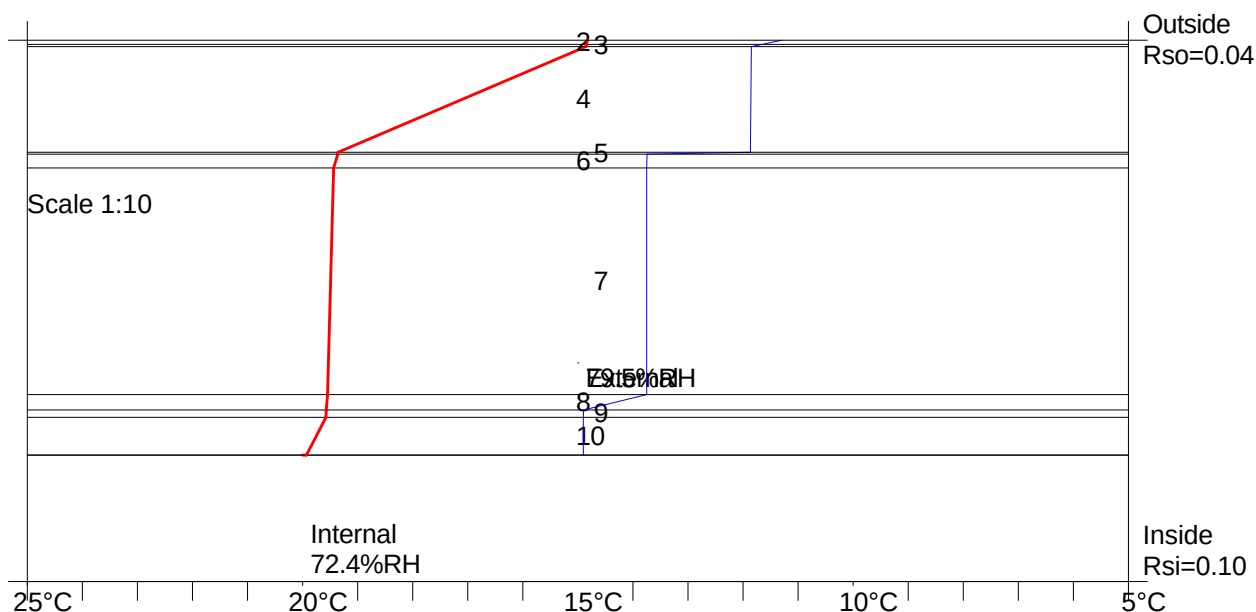
Condensation Risk Analysis (no account taken of thermal bridges)

4 - Sports halls, kitchens, canteens, school classrooms, hospitals and buildings with unflued gas heaters

Jan (worst)	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec												
20.0C	68.1%	20.0C	67.5%	20.0C	65.8%	20.0C	64.9%	20.0C	65.1%	20.0C	68.8%	20.0C	72.4%	20.0C	73.0%	20.0C	71.1%	20.0C	69.5%	20.0C	68.1%	20.0C	68.3%
-5.0C	87.0%	-5.0C	85.0%	4.7C	80.5%	6.9C	78.0%	10.3C	75.5%	13.2C	77.5%	14.8C	79.5%	14.7C	80.5%	12.5C	82.5%	9.6C	85.0%	5.3C	86.5%	3.5C	87.5%

	Interface Temp. °C	Dewpoint Temp. °C	Vapour Pressure (kPa)	Saturated V.P. (kPa)	Worst Cond. (g/m²)	Peak Buildup (g/m²)	Condensation
1 Outside surface resistance							
2 Bauder K5K Capping Sheet	14.8	11.3	1.34	1.69			No
3 Bauder KSA DUO Underlayer	14.8	11.7	1.37	1.69			No
4 BauderPIR FA-TE Flatboard Insulation	14.9	11.9	1.39	1.69	0.2 in Jan	0 in Feb	Yes
5 BauderTEC KSD FBS Air & Vapour Control Layer	19.4	11.9	1.39	2.25			No
6 Plywood (700 kg/m³)	19.4	13.7	1.57	2.25			No
7 Cavity Between Joists@400 Centres	19.4	13.8	1.57	2.26			No
8 Asphalt	19.5	13.8	1.57	2.27			No
9 Concrete screed	19.6	14.9	1.69	2.28			No
10 Woodwool slabs	19.6	14.9	1.69	2.28			No
11 Inside surface resistance	19.9	14.9	1.69	2.33			No

Worst case internal / external conditions for graph : 20.0°C @ 72.4%RH / 14.8°C @ 79.5%RH



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