

Back to Earth SW Ltd

7 Tuns Lane
Silverton
Exeter
EX5 4HY

Project Information

Reference

Date 4 December 2023

Construction Type

Element : Wall - Wall-masonry-cavity-internal-plasterboard

Internal surface emissivity : High External surface emissivity : High

	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m ² K/W)	Pitch (°)	Bridge details Air gaps (Level, Delta U")
Outside surface resistance	-	-	0.130		
Brick outer leaf	105.0	0.770	0.000		
Airspace, heat flow horizontal, 50 mm thick	50.0	-	0.000		
Brick inner leaf	105.0	0.560	0.188		
Clay Plaster	10.0	0.800	0.013		
UdiTHERM	40.0	0.038	1.050		L:0 0.000W/m ² K
Ampatex Variano	-	-	-		
SteicoFlex	25.0	0.036	0.650		11.800% Softwood (25.0mm) L:0 0.000W/m ² K
Gyproc Wallboard	12.5	0.190	0.066		
Inside surface resistance	-	-	0.130		

Total thickness 347.5mm

U-value = 0.49W/m²K

U-value, Combined Method : 0.489W/m²K (upper/lower limit 2.160 / 2.084m²K/W, dUf 0.0178, dUg 0.0000, dUp0.0000, dUr0.0000, dUrc1 0.0000, dUrc2 0.0000)

Correction factors

Mechanical fasteners :-

Insulation Fixings

Alpha : 0.80 per m lambda f : 50.0000W/mK nf : 4.000 per m² Af : 20.000mm² Recess : 0.0mm

Delta Uf for UdiTHERM : 0.0178

nf = fasteners per m² Af = fasteners cross-sectional area

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	-	-	0.130	-	-
Brick outer leaf	105.0	0.770	0.000	50.00	5.25
Airspace, heat flow horizontal, 50 mm thick	50.0	-	0.000	-	0.00
Brick inner leaf	105.0	0.560	0.188	50.00	5.25
Clay Plaster	10.0	0.800	0.013	25.00	0.25
UdiTHERM	40.0	0.038	1.050	25.00	1.00
Ampatex Variano	-	-	-	-	21.00
SteicoFlex	25.0	0.036	0.650	5.00	0.13
Gyproc Wallboard	12.5	0.190	0.066	50.00	0.63
Inside surface resistance	-	-	0.130	-	-
Total thickness	347.5mm				

Detailed U-value Calculation Results

Construction includes 1 bridged layer

Non-bridged layers

Outside surface resistance	0.130 m ² K/W
Brick inner leaf	0.188 m ² K/W
Clay Plaster	0.013 m ² K/W
UdiTHERM	1.050 m ² K/W
Gyproc Wallboard	0.066 m ² K/W
Inside surface resistance	0.130 m ² K/W
<u>Resistance of non-bridged layers, R_{NB} =</u>	<u>1.576 m²K/W</u>

Bridged layer

SteicoFlex (L1) bridged by Softwood (B1)

Path 1 - SteicoFlex

Path 2 - Softwood

Resistance and fraction of heat flow paths

$$R_{P1} = R_{NB} + R_{L1} = 1.576 + 0.650 = 2.226 \text{ m}^2\text{K/W} \quad F_{P1} = 88.200\%$$

$$R_{P2} = R_{NB} + R_{L2} = 1.576 + 0.192 = 1.768 \text{ m}^2\text{K/W} \quad F_{P2} = 11.800\%$$

Upper resistance limit

$$R_{\text{upper}} = 1 / \left(\frac{F_{P1}}{R_{P1}} + \frac{F_{P2}}{R_{P2}} \right)$$

$$R_{\text{upper}} = 1 / \left(\frac{0.882}{2.226} + \frac{0.118}{1.768} \right) = 2.160 \text{ m}^2\text{K/W}$$

Lower resistance limit

$$R_{\text{lower}} = R_{NB} + 1 / \left(\frac{F_{L1}}{R_{L1}} + \frac{F_{B1}}{R_{B1}} \right)$$

$$R_{\text{lower}} = 1.576 + 1 / \left(\frac{0.882}{0.650} + \frac{0.118}{0.192} \right) = 2.084 \text{ m}^2\text{K/W}$$

Total resistance of wall

$$R_T = (R_{\text{upper}} + R_{\text{lower}}) / 2 = (2.160 + 2.084) / 2 = 2.12 \text{ m}^2\text{K/W}$$

Mechanical fasteners :-

Calculations to BS EN ISO 6946:2007

Insulation Fixings

Alpha : 0.80 per m lambda f : 50.0000W/mK nf : 4.000 per m² Af : 20.000mm² Recess : 0.0mm

Delta Uf for UdiTHERM : 0.0178

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

$$U = (1 / R_T) + (\Delta U_f + \Delta U_g + \Delta U_p + \Delta U_{rc2} + \Delta U_{rc2}) = (1/2.1218) + 0.0178 + 0.0000 + 0.0000 + 0.0000 + 0.0000 = 0.49 \text{ W/m}^2\text{K}$$

Structure element : Wall
Condensation calculations performed in accordance with BS5250:2021

Condensation is occurring at the following layers interfaces:-

Month	Int (C°)	Int (%RH)	Ext (C°)	Ext (%RH)
Jan	21.00	45.10	3.10	85.00
Feb	21.00	44.60	3.10	83.50
Mar	21.00	45.40	5.20	79.50
Apr	21.00	46.70	7.60	75.50
May	21.00	51.40	10.60	76.00
Jun	21.00	57.20	14.00	74.50
Jul	21.00	61.90	15.80	75.00
Aug	21.00	62.60	15.40	77.50
Sep	21.00	58.60	13.20	79.50
Oct	21.00	53.90	10.00	83.00
Nov	21.00	48.00	6.00	84.00
Dec	21.00	46.40	4.20	85.50

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) = 0.00000 Kg/m²

Annual moisture accumulation = 0.00000 Kg/m²

Project Information

Reference

Date 4 December 2023

Thermal Mass Details

	Thickness assessed (actual) (mm)	Density (kg/m ³)	Specific heat capacity (J/kgK)	Heat capacity (kJ/m ² K)
Brick outer leaf	0.0 (105.0)	1700.0	840.0	0.0
Airspace, heat flow horizontal, 50 mm thick	0.0 (50.0)	1.2	1008.0	0.0
Brick inner leaf	0.0 (105.0)	1700.0	840.0	0.0
Clay Plaster	0.0 (10.0)	1700.0	1000.0	0.0
UdiTHERM	0.0 (40.0)	160.0	2100.0	0.0
Ampatex Variano	0.0 (-)	280.0	850.0	0.0
SteicoFlex	0.0 (25.0)	60.0	2100.0	0.0
Gyproc Wallboard	12.5 (12.5)	0.0	0.0	0.0
Total				0.0
kappa value				0.0000
Limiting condition:	insulation			

Admittance : 0.63 W/m²K Decrement : 0.15 factor Decrement delay : -10.65 hours

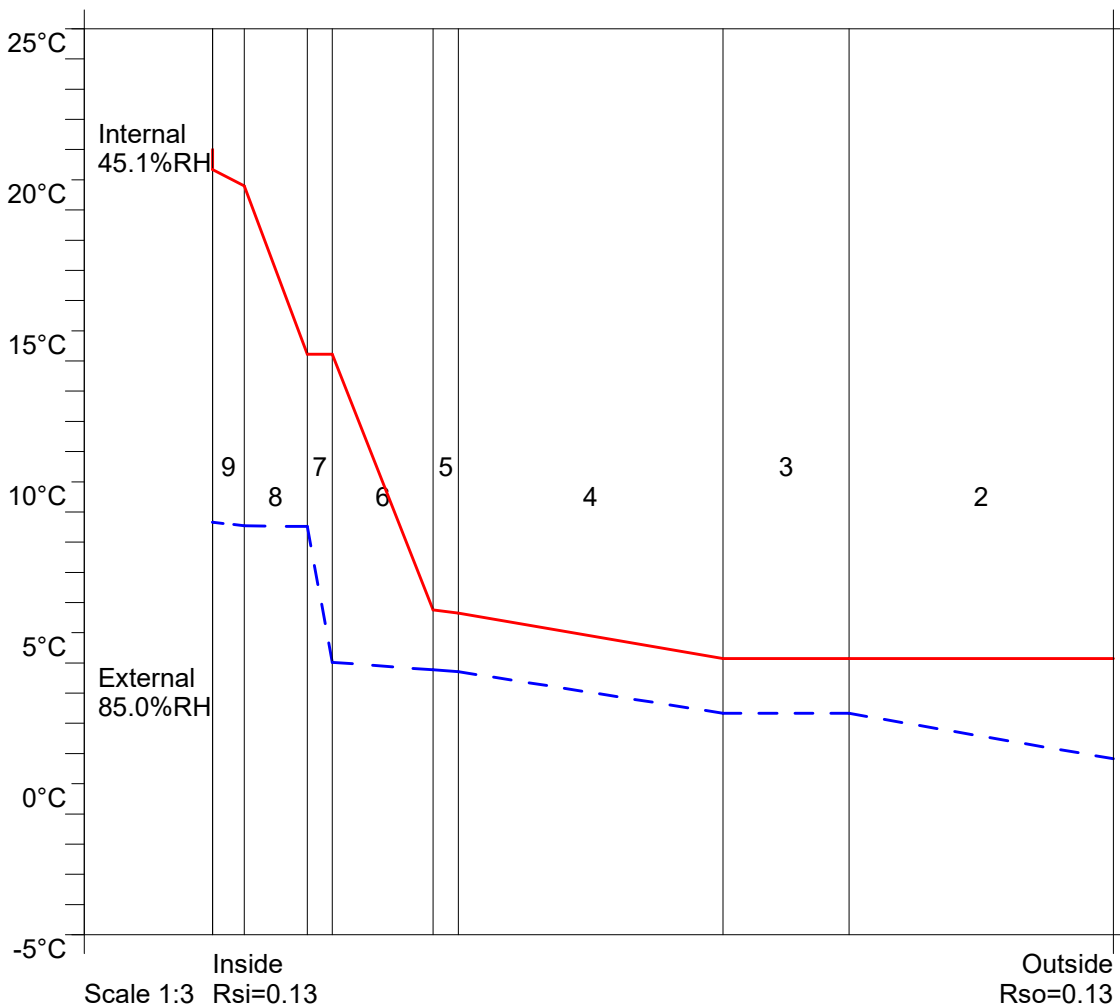
Condensation Risk Analysis (no account taken of thermal bridges)

2 - Offices, shops and dwellings with low occupancy

Jan (worst)	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
21.0C 45.1%	21.0C 44.6%	21.0C 45.4%	21.0C 46.7%	21.0C 51.4%	21.0C 57.2%	21.0C 61.9%	21.0C 62.6%	21.0C 58.6%	21.0C 53.9%	21.0C 48.0%	21.0C 46.4%
3.1C 85.0%	3.1C 83.5%	5.2C 79.5%	7.6C 75.5%	10.6C 76.0%	14.0C 74.5%	15.8C 75.0%	15.4C 77.5%	13.2C 79.5%	10.0C 83.0%	6.0C 84.0%	4.2C 85.5%

	Interface Temp. °C	Dewpoint Temp. °C	Vapour Pressure (kPa)	Saturated V.P. (kPa)	Worst Cond. (g/m ²)	Peak Buildup (g/m ²)	Condensation
1 Outside surface resistance							
2 Brick outer leaf	4.1	0.8	0.65	0.82			No
3 Airspace, heat flow horizontal, 50 mm thick	4.1	2.3	0.72	0.82			No
4 Brick inner leaf	4.1	2.3	0.72	0.82			No
5 Clay Plaster	5.7	3.7	0.80	0.91			No
6 UdiTHERM	5.8	3.8	0.80	0.92			No
7 Ampatex Variano	14.2	4.0	0.81	1.62			No
8 SteicoFlex	14.2	8.5	1.11	1.62			No
9 Gyproc Wallboard	19.8	8.5	1.11	2.31			No
10 Inside surface resistance	20.3	8.7	1.12	2.39			No

Worst case internal / external conditions for graph : 21.0°C @ 45.1%RH / 3.1°C @ 85.0%RH



Condensation Risk Analysis (no account taken of thermal bridges)

2 - Offices, shops and dwellings with low occupancy

Jan (worst)	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
21.0C 45.1%	21.0C 44.6%	21.0C 45.4%	21.0C 46.7%	21.0C 51.4%	21.0C 57.2%	21.0C 61.9%	21.0C 62.6%	21.0C 58.6%	21.0C 53.9%	21.0C 48.0%	21.0C 46.4%
3.1C 85.0%	3.1C 83.5%	5.2C 79.5%	7.6C 75.5%	10.6C 76.0%	14.0C 74.5%	15.8C 75.0%	15.4C 77.5%	13.2C 79.5%	10.0C 83.0%	6.0C 84.0%	4.2C 85.5%

	Interface Temp. °C	Dewpoint Temp. °C	Vapour Pressure (kPa)	Saturated V.P. (kPa)	Worst Cond. (g/m ²)	Peak Buildup (g/m ²)	Conden-sation
1 Outside surface resistance							
2 Brick outer leaf	16.1	11.4	1.35	1.83			No
3 Airspace, heat flow horizontal, 50 mm thick	16.1	11.7	1.38	1.83			No
4 Brick inner leaf	16.1	11.7	1.38	1.83			No
5 Clay Plaster	16.5	12.1	1.41	1.88			No
6 UdiTHERM	16.6	12.1	1.41	1.88			No
7 Ampatex Variano	19.0	12.1	1.41	2.20			No
8 SteicoFlex	19.0	13.4	1.53	2.20			No
9 Gyproc Wallboard	20.7	13.4	1.53	2.43			No
10 Inside surface resistance	20.8	13.4	1.54	2.46			No

Worst case internal / external conditions for graph : 21.0°C @ 61.9%RH / 15.8°C @ 75.0%RH

