

Project Information

Reference

Date 14 September 2018

Construction Type

Element : Wall - 0 Spec generator copies

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		
Render, lime-sand	7.0	0.800	0.009		
Diffutherm	100.0	0.043	2.300		L:0 0.000W/m ² K
UdiTHERM	60.0	0.039	1.500		L:0 0.000W/m ² K
Render, lime-sand	15.0	0.800	0.019		
Blockwork - outer leaf, medium	100.0	0.500	0.200		6.700% Mortar (10.0mm)
Superwhite 40 - Cavity Wall	50.0	0.040	1.250		L:1 0.010W/m ² K
Brick inner leaf	100.0	0.560	0.179		
Render, lime-sand	25.0	0.800	0.031		
Inside surface resistance	-	-	0.130		
Total thickness	457.0mm				

U-value = 0.17W/m²K

U-value, Combined Method : 0.174W/m²K (upper/lower limit 5.741 / 5.737m²K/W, dUf 0.0025, dUg 0.0005, dUp0.0000, dUr0.0000, dUrc1 0.0000, dUrc2 0.0000)

Correction factors

Mechanical fasteners :-

Warm pitched roof - insulation over rafters

Alpha : 0.80 per m lambda f : 17.0000W/mK nf : 6.700 per m² Af : 7.450mm² Recess : 0.0mm

Delta Uf for Diffutherm : 0.0011

Wall with cavity fill, mild steel double triangle ties, 900 x 450 cntrs - walls upto 15m with >=90mm leaves

Alpha : 0.80 per m lambda f : 60.0000W/mK nf : 2.500 per m² Af : 12.500mm² Recess : 0.0mm

Delta Uf for Superwhite 40 - Cavity Wall : 0.0014

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	-	-
Render, lime-sand	7.0	0.800	0.009	50.00	0.35
Diffutherm	100.0	0.043	2.300	25.00	2.50
UdiTHERM	60.0	0.039	1.500	25.00	1.50
Render, lime-sand	15.0	0.800	0.019	50.00	0.75
Blockwork - outer leaf, medium	100.0	0.500	0.200	50.00	5.00
Superwhite 40 - Cavity Wall	50.0	0.040	1.250	5.00	0.25
Brick inner leaf	100.0	0.560	0.179	50.00	5.00
Render, lime-sand	25.0	0.800	0.031	50.00	1.25
Inside surface resistance	-	-	0.130	-	-
Total thickness	457.0mm				

Detailed U-value Calculation Results

Construction includes 1 bridged layer

Non-bridged layers

Outside surface resistance	0.130 m ² K/W
Render, lime-sand	0.009 m ² K/W
Diffutherm	2.300 m ² K/W
UdiTHERM	1.500 m ² K/W
Render, lime-sand	0.019 m ² K/W
Superwhite 40 - Cavity Wall	1.250 m ² K/W
Brick inner leaf	0.179 m ² K/W
Render, lime-sand	0.031 m ² K/W
Inside surface resistance	0.130 m ² K/W
<u>Resistance of non-bridged layers, R_{NB} =</u>	<u>5.548 m²K/W</u>

Bridged layer

Blockwork - outer leaf, medium (L1) bridged by Mortar (B1)

Path 1 - Blockwork

Path 2 - Mortar

Resistance and fraction of heat flow paths

$$R_{P1} = R_{NB} + R_{L1} = 5.548 + 0.200 = 5.748 \text{ m}^2\text{K/W} \quad F_{P1} = 93.300\%$$

$$R_{P2} = R_{NB} + R_{L2} = 5.548 + 0.106 = 5.654 \text{ m}^2\text{K/W} \quad F_{P2} = 6.700\%$$

Upper resistance limit

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

$$R_{upper} = 1 / \left(\frac{0.933}{5.748} + \frac{0.067}{5.654} \right) = 5.741 \text{ m}^2\text{K/W}$$

Lower resistance limit

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

$$R_{lower} = 5.548 + 1 / \left(\frac{0.933}{0.200} + \frac{0.067}{0.106} \right) = 5.737 \text{ m}^2\text{K/W}$$

Total resistance of wall

$$R_T = (R_{upper} + R_{lower}) / 2 = (5.741 + 5.737) / 2 = 5.74 \text{ m}^2\text{K/W}$$

Mechanical fasteners :-

Calculations to BS EN ISO 6946:2007

Warm pitched roof - insulation over rafters

Alpha : 0.80 per m lambda f : 17.0000W/mK nf : 6.700 per m² Af : 7.450mm² Recess : 0.0mm

Delta Uf for Diffutherm : 0.0011

Wall with cavity fill, mild steel double triangle ties, 900 x 450 cntrs - walls upto 15m with >=90mm leaves

Alpha : 0.80 per m lambda f : 60.0000W/mK nf : 2.500 per m² Af : 12.500mm² Recess : 0.0mm

Delta Uf for Superwhite 40 - Cavity Wall : 0.0014

Correction for air gaps, Delta Ug = 0.0005W/m²K

(Delta Uf + Delta Ug + Delta Up + Delta Ur) is less than 3% of (1 / Rt) so U = (1 / Rt) + (Delta Ur) + (Delta Urc) = 0.17 W/m²K

Structure element : Wall
Condensation calculations performed in accordance with BS5250:2011

Condensation is occurring at the following layers interfaces:-

Month	Int (C°)	Int (%RH)	Ext (C°)	Ext (%RH)
Jan	21.00	54.70	3.50	86.00
Feb	21.00	53.80	3.80	82.50
Mar	21.00	53.90	5.70	80.00
Apr	21.00	54.40	8.00	77.00
May	21.00	57.90	11.30	77.00
Jun	21.00	62.20	14.40	76.00
Jul	21.00	66.80	16.50	76.50
Aug	21.00	67.40	16.10	78.50
Sep	21.00	64.60	13.80	81.50
Oct	21.00	60.80	10.70	84.00
Nov	21.00	56.50	6.40	85.50
Dec	21.00	55.50	4.50	86.50

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

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Thermal Mass Details

	Thickness assessed (actual) (mm)	Density (kg/m ³)	Specific heat capacity (J/kgK)	Heat capacity (kJ/m ² K)
Render, lime-sand	0.0 (7.0)	1600.0	1000.0	0.0
Diffutherm	0.0 (100.0)	190.0	2100.0	0.0
UdiTHERM	0.0 (60.0)	140.0	2100.0	0.0
Render, lime-sand	0.0 (15.0)	1600.0	1000.0	0.0
Blockwork - outer leaf, medium	0.0 (100.0)	1400.0	840.0	0.0
Superwhite 40 - Cavity Wall	0.0 (50.0)	0.0	0.0	0.0
Brick inner leaf	75.0 (100.0)	1700.0	840.0	107100000.0
Render, lime-sand	25.0 (25.0)	1600.0	1000.0	40000000.0
Total				147100000.0
kappa value				147.1000
Limiting condition:	100mm in			

Admittance : 4.42 W/m²K Decrement : 0.06 factor Decrement delay : -18.82 hours

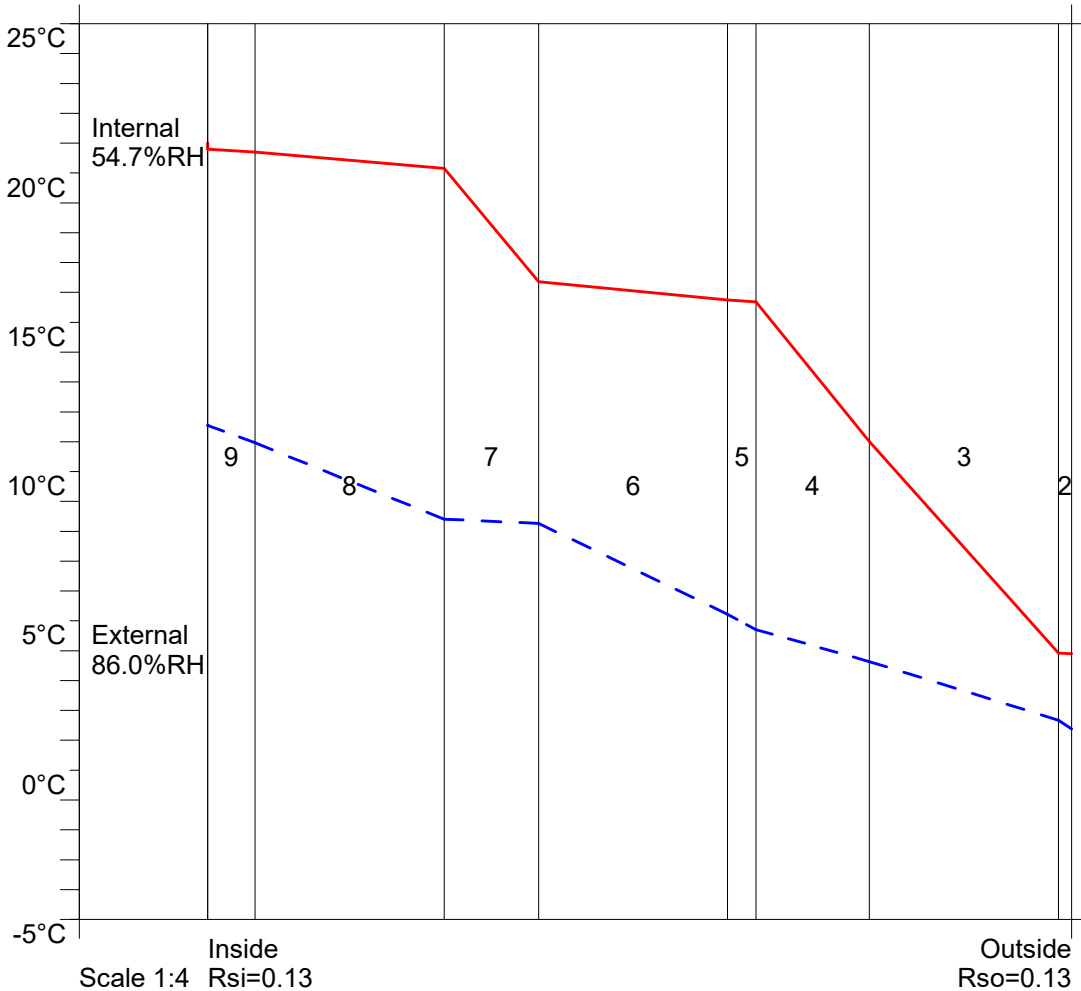
Condensation Risk Analysis (no account taken of thermal bridges)

3 - Dwellings with low occupancy

Jan (worst)	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
21.0C 54.7%	21.0C 53.8%	21.0C 53.9%	21.0C 54.4%	21.0C 57.9%	21.0C 62.2%	21.0C 66.8%	21.0C 67.4%	21.0C 64.6%	21.0C 60.8%	21.0C 56.5%	21.0C 55.5%
3.5C 86.0%	3.8C 82.5%	5.7C 80.0%	8.0C 77.0%	11.3C 77.0%	14.4C 76.0%	16.5C 76.5%	16.1C 78.5%	13.8C 81.5%	10.7C 84.0%	6.4C 85.5%	4.5C 86.5%

	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 Render, lime-sand	3.9	1.4	0.67	0.81			No
3 Diffutherm	3.9	1.7	0.69	0.81			No
4 UdiTHERM	11.0	3.6	0.79	1.31			No
5 Render, lime-sand	15.7	4.7	0.85	1.78			No
6 Blockwork - outer leaf, medium	15.7	5.2	0.89	1.79			No
7 Superwhite 40 - Cavity Wall (Delta U" = 0.010W/m ² K)	16.4	8.3	1.09	1.86		0 in Jan	No
8 Brick inner leaf	20.2	8.4	1.10	2.36			No
9 Render, lime-sand	20.7	11.0	1.31	2.44			No
10 Inside surface resistance	20.8	11.5	1.36	2.46			No

Worst case internal / external conditions for graph : 21.0°C @ 54.7%RH / 3.5°C @ 86.0%RH



Condensation Risk Analysis (no account taken of thermal bridges)

3 - Dwellings with low occupancy

Jan (worst)	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
21.0C 54.7%	21.0C 53.8%	21.0C 53.9%	21.0C 54.4%	21.0C 57.9%	21.0C 62.2%	21.0C 66.8%	21.0C 67.4%	21.0C 64.6%	21.0C 60.8%	21.0C 56.5%	21.0C 55.5%
3.5C 86.0%	3.8C 82.5%	5.7C 80.0%	8.0C 77.0%	11.3C 77.0%	14.4C 76.0%	16.5C 76.5%	16.1C 78.5%	13.8C 81.5%	10.7C 84.0%	6.4C 85.5%	4.5C 86.5%

	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 Render, lime-sand	16.6	12.4	1.44	1.89			No
3 Diffutherm	16.6	12.4	1.44	1.89			No
4 UdiTHERM	18.4	12.8	1.47	2.12			No
5 Render, lime-sand	19.6	13.0	1.49	2.28			No
6 Blockwork - outer leaf, medium	19.6	13.1	1.50	2.29			No
7 Superwhite 40 - Cavity Wall (Delta U" = 0.010W/m ² K)	19.8	13.8	1.57	2.31		0 in Jan	No
8 Brick inner leaf	20.8	13.8	1.58	2.45			No
9 Render, lime-sand	20.9	14.4	1.64	2.47			No
10 Inside surface resistance	20.9	14.6	1.66	2.48			No

Worst case internal / external conditions for graph : 21.0°C @ 66.8%RH / 16.5°C @ 76.5%RH

