



ARCHITECTURAL FAÇADES

**Alsecco (UK) Ltd**

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**Project Information**

Reference 2000082(LR)  
Date 12 March 2020  
Project Beauvoir, Rue Des Monts, St Sampson, GUERNSEY, GY2 4HT

**Construction Type**

Element	: Wall - Uvalue - Existing					
Internal surface emissivity	: High	External surface emissivity		: High		
		Thickness	Thermal Conductivity	Thermal Resistance	Pitch	Bridge details
		(mm)	(W/mK)	(m <sup>2</sup> K/W)	(°)	Air gaps (Level, Delta U")
Outside surface resistance	-	-	-	0.040		
Render (BS5250)		15.0	0.800	0.019		
Brick, Dense, external		215.0	1.099	0.196		17.185% Mortar (215.0mm)
Inside surface resistance	-	-	-	0.130		
<b>Total thickness</b>		<b>230.0mm</b>				

**U-value = 2.57 W/m<sup>2</sup>K**

U-value, Combined Method : 2.57 W/m<sup>2</sup>K (upper/lower limit 0.390 / 0.389m<sup>2</sup>K/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/m<sup>2</sup>K

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

	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m <sup>2</sup> K/W)	Vapour Resistivity (MNs/gm)	Vapour Resistance (MNs/g)
Outside surface resistance	-	-	0.040	-	-
Render (BS5250)	15.0	0.800	0.019	100.00	1.50
Brick, Dense, external	215.0	1.099	0.196	80.00	17.20
Inside surface resistance	-	-	0.130	-	-
<b>Total thickness</b>	<b>230.0mm</b>				

## Detailed U-value Calculation Results

Construction includes 1 bridged layer

### Non-bridged layers

Outside surface resistance	0.040 m <sup>2</sup> K/W
Render (BS5250)	0.019 m <sup>2</sup> K/W
Inside surface resistance	0.130 m <sup>2</sup> K/W
Resistance of non-bridged layers, $R_{NB}$ =	0.189 m <sup>2</sup> K/W

### Bridged layer

Brick, Dense, external (L1) bridged by Mortar (B1)

Path 1 - Brick, Den

Path 2 - Mortar

### Resistance and fraction of heat flow paths

$$R_{P1} = R_{NB} + R_{L1} = 0.189 + 0.196 = 0.384 \text{ m}^2\text{K/W} \quad F_{P1} = 82.815\%$$

$$R_{P2} = R_{NB} + R_{L2} = 0.189 + 0.229 = 0.417 \text{ m}^2\text{K/W} \quad F_{P2} = 17.185\%$$

### Upper resistance limit

$$R_{upper} = 1 / \left( \frac{F_{P1}}{R_{P1}} + \frac{F_{P2}}{R_{P2}} \right)$$
$$R_{upper} = 1 / \left( \frac{0.828}{0.384} + \frac{0.172}{0.417} \right) = 0.390 \text{ m}^2\text{K/W}$$

### Lower resistance limit

$$R_{lower} = R_{NB} + 1 / \left( \frac{F_{L1}}{R_{L1}} + \frac{F_{B1}}{R_{B1}} \right)$$
$$R_{lower} = 0.189 + 1 / \left( \frac{0.828}{0.196} + \frac{0.172}{0.229} \right) = 0.389 \text{ m}^2\text{K/W}$$

### Total resistance of wall

$$R_T = ( R_{upper} + R_{lower} ) / 2 = (0.390 + 0.389) / 2 = 0.39 \text{ m}^2\text{K/W}$$

Correction for air gaps, Delta Ug = 0.0000W/m<sup>2</sup>K

(Delta Uf + Delta Ug + Delta Up + Delta Ur) is less than 3% of (1 / Rt) so  $U = (1 / R_T) + (\text{Delta Ur}) + (\text{Delta Urc}) = 2.57 \text{ W/m}^2\text{K}$

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	20.00	59.70	5.90	85.50
Feb	20.00	58.70	5.70	83.50
Mar	20.00	59.10	6.90	82.00
Apr	20.00	59.80	8.80	79.50
May	20.00	63.00	11.50	79.00
Jun	20.00	68.40	14.30	79.50
Jul	20.00	73.20	16.10	80.50
Aug	20.00	73.70	16.00	81.50
Sep	20.00	70.80	14.30	83.00
Oct	20.00	67.20	11.90	85.00
Nov	20.00	61.90	8.50	84.50
Dec	20.00	60.70	7.00	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/m<sup>2</sup>

Annual moisture accumulation = 0.00000 Kg/m<sup>2</sup>

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**Thermal Mass Details**

	Thickness assessed (actual) (mm)	Density (kg/m <sup>3</sup> )	Specific heat capacity (J/kgK)	Heat capacity (kJ/m <sup>2</sup> K)
Render (BS5250)	0.0 (15.0)	1600.0	0.0	0.0
Brick, Dense, external	100.0 (215.0)	1850.0	0.0	0.0
Total kappa value				0.0 0.0000
Limiting condition:	100mm in			

Admittance : 5.88 W/m<sup>2</sup>K    Decrement : 2.26 factor    Decrement delay : 0.00 hours

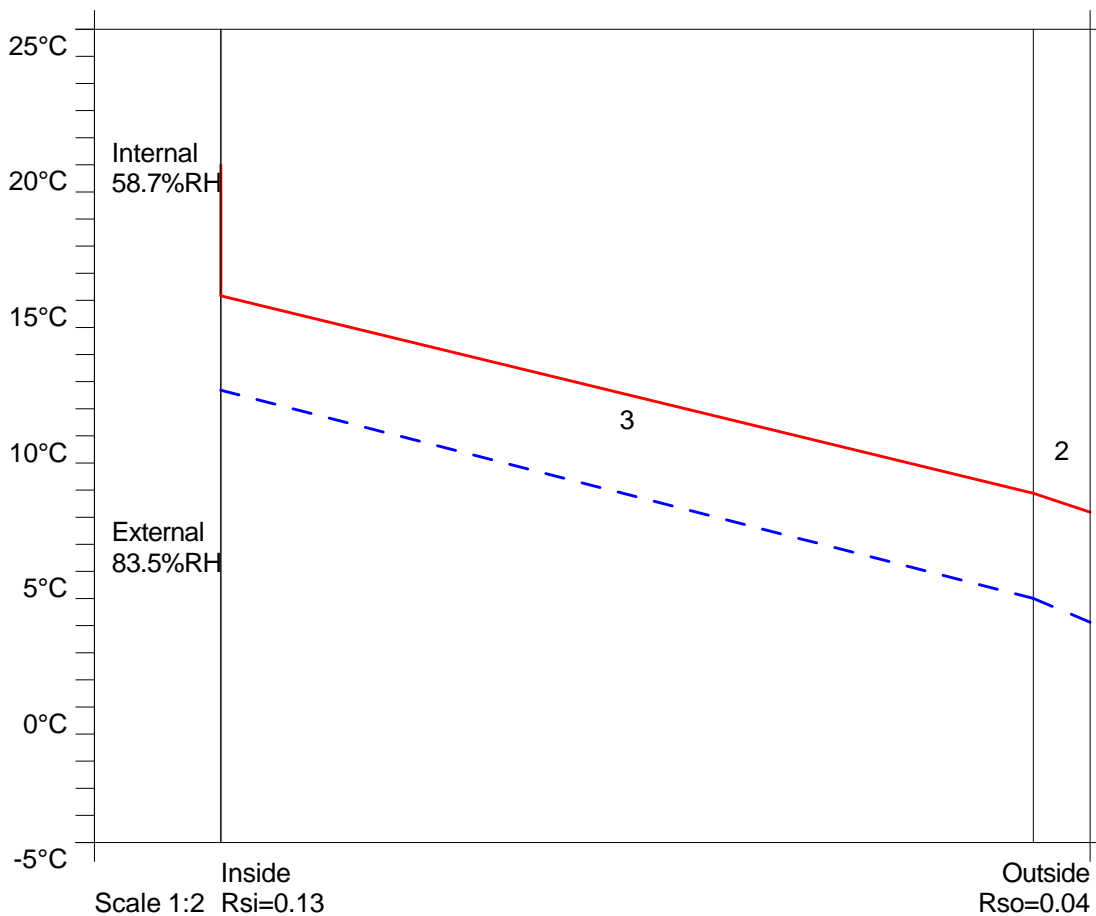
### Condensation Risk Analysis (no account taken of thermal bridges)

#### 3 - Dwellings with low occupancy

Jan	Feb (worst)	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
20.0C	59.7%	20.0C	58.7%	20.0C	59.1%	20.0C	59.8%	20.0C	63.0%	20.0C	68.4%
20.0C	68.4%	20.0C	73.2%	20.0C	73.7%	20.0C	70.8%	20.0C	67.2%	20.0C	61.9%
20.0C	60.7%	5.9C	85.5%	5.7C	83.5%	6.9C	82.0%	8.8C	79.5%	11.5C	79.0%
14.3C	79.5%	14.3C	79.5%	16.1C	80.5%	16.0C	81.5%	14.3C	83.0%	11.9C	85.0%
8.5C	84.5%	7.0C	85.5%								

	Interface Temp. °C	Dewpoint Temp. °C	Vapour Pressure (kPa)	Saturated V.P. (kPa)	Worst Cond. (g/m <sup>2</sup> )	Peak Buildup (g/m <sup>2</sup> )	Condensation
1 Outside surface resistance	7.2	3.1	0.76	1.01			No
2 Render (BS5250)	7.9	4.0	0.81	1.06			No
3 Brick, Dense, external	15.2	11.7	1.37	1.72			No
4 Inside surface resistance							

Worst case internal / external conditions for graph : 20.0°C @ 58.7%RH / 5.7°C @ 83.5%RH



### Condensation Risk Analysis (no account taken of thermal bridges)

#### 3 - Dwellings with low occupancy

Jan	Feb (worst)	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
20.0C	59.7%	20.0C	58.7%	20.0C	59.1%	20.0C	59.8%	20.0C	63.0%	20.0C	68.4%
20.0C	59.7%	20.0C	58.7%	20.0C	59.1%	20.0C	59.8%	20.0C	63.0%	20.0C	68.4%
5.9C	85.5%	5.7C	83.5%	6.9C	82.0%	8.8C	79.5%	11.5C	79.0%	14.3C	79.5%
14.3C	79.5%	16.1C	80.5%	16.0C	81.5%	14.3C	83.0%	11.9C	85.0%	8.5C	84.5%
7.0C	85.5%										

	Interface Temp. °C	Dewpoint Temp. °C	Vapour Pressure (kPa)	Saturated V.P. (kPa)	Worst Cond. (g/m <sup>2</sup> )	Peak Buildup (g/m <sup>2</sup> )	Condensation
1 Outside surface resistance	16.5	12.8	1.47	1.88			No
2 Render (BS5250)	16.7	13.0	1.49	1.90			No
3 Brick, Dense, external	18.7	15.1	1.71	2.15			No
4 Inside surface resistance							

Worst case internal / external conditions for graph : 20.0°C @ 73.2%RH / 16.1°C @ 80.5%RH

