

# Back to Earth SW Ltd

7 Tuns Lane  
Silverton  
Exeter  
EX5 4HY

## Project Information

Reference

Date 22 November 2023

## Construction Type

Element : Wall - Wall-CLT-120mm-Render

Internal surface emissivity : High External surface emissivity : High

|                                 | Thickness<br>(mm) | Thermal<br>Conductivity<br>(W/mK) | Thermal<br>Resistance<br>(m <sup>2</sup> K/W) | Pitch<br>(°) | Bridge details<br>Air gaps<br>(Level, Delta U") |
|---------------------------------|-------------------|-----------------------------------|---|--------------|---|
| Outside surface resistance      | -                 | -                                 | 0.040   |              |   |
| Beltermo Ultra                  | 120.0             | 0.042                             | 2.850   |              | L:0 0.000W/m <sup>2</sup> K                     |
| UdiTHERM                        | 200.0             | 0.038                             | 5.250   |              | L:0 0.000W/m <sup>2</sup> K                     |
| Ampatex Solero                  | -                 | -                                 | -   |              |   |
| Timber (500 kg/m <sup>3</sup> ) | 120.0             | 0.130                             | 0.923   |              |   |
| Inside surface resistance       | -                 | -                                 | 0.130   |              |   |
| <b>Total thickness</b>          | <b>440.0mm</b>    |                                   |   |              |   |

**U-value = 0.12W/m<sup>2</sup>K**

U-value, Combined Method : 0.119W/m<sup>2</sup>K (upper/lower limit 9.193 / 9.193m<sup>2</sup>K/W, dUf 0.0101, dUg 0.0000, 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 : 50.0000W/mK nf : 9.000 per m<sup>2</sup> Af : 12.500mm<sup>2</sup> Recess : 10.0mm

Delta Uf for Beltermo Ultra : 0.0028

Warm pitched roof - insulation over rafters

Alpha : 0.80 per m lambda f : 50.0000W/mK nf : 9.000 per m<sup>2</sup> Af : 12.500mm<sup>2</sup> Recess : 0.0mm

Delta Uf for UdiTHERM : 0.0073

nf = fasteners per m<sup>2</sup> Af = fasteners cross-sectional area

Air gaps, Delta Ug = 0.000W/m<sup>2</sup>K

|                                 | Thickness<br>(mm) | Thermal<br>Conductivity<br>(W/mK) | Thermal<br>Resistance<br>(m <sup>2</sup> K/W) | Vapour<br>Resistivity<br>(MNs/gm) | Vapour<br>Resistance<br>(MNs/g) |
|---------------------------------|-------------------|-----------------------------------|---|-----------------------------------|---------------------------------|
| Outside surface resistance      | -                 | -                                 | 0.040   | -                                 | -                               |
| Beltermo Ultra                  | 120.0             | 0.042                             | 2.850   | 15.00                             | 1.80                            |
| UdiTHERM                        | 200.0             | 0.038                             | 5.250   | 25.00                             | 5.00                            |
| Ampatex Solero                  | -                 | -                                 | -   | -                                 | 25.00                           |
| Timber (500 kg/m <sup>3</sup> ) | 120.0             | 0.130                             | 0.923   | 250.00                            | 30.00                           |
| Inside surface resistance       | -                 | -                                 | 0.130   | -                                 | -                               |
| <b>Total thickness</b>          | <b>440.0mm</b>    |                                   |   |                                   |                                 |

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/m<sup>2</sup>

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

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**Thermal Mass Details**

|                                 | Thickness<br>assessed (actual)<br>(mm) | Density<br>(kg/m <sup>3</sup> ) | Specific heat<br>capacity<br>(J/kgK) | Heat<br>capacity<br>(kJ/m <sup>2</sup> K) |
|---------------------------------|--|---------------------------------|--------------------------------------|---|
| Beltermo Ultra                  | 0.0 (120.0)                            | 180.0                           | 2100.0                               | 0.0                                       |
| UdiTHERM                        | 0.0 (200.0)                            | 140.0                           | 2100.0                               | 0.0                                       |
| Ampatex Solero                  | 0.0 (-)                                | 280.0                           | 850.0                                | 0.0                                       |
| Timber (500 kg/m <sup>3</sup> ) | 100.0 (120.0)                          | 500.0                           | 1600.0                               | 8000000.0                                 |
| Total                           |  |                                 |                                      | 8000000.0                                 |
| kappa value                     |  |                                 |                                      | 80.0000                                   |
| Limiting condition:             | 100mm in                               |                                 |                                      |   |

Admittance : 2.19 W/m<sup>2</sup>K    Decrement : 0.01 factor    Decrement delay : -1.87 hours

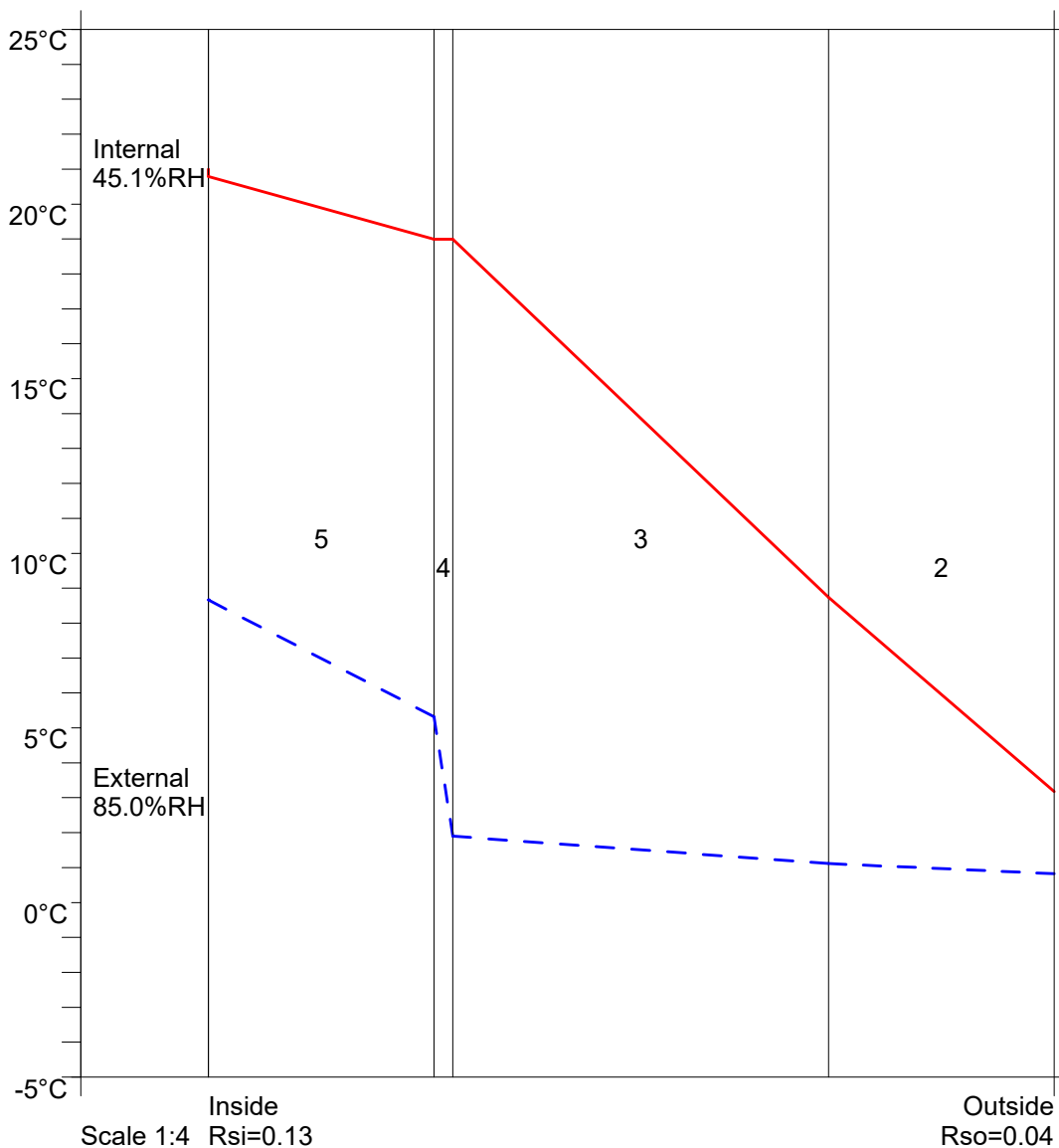
## Condensation Risk Analysis (no account taken of thermal bridges)

### 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 <sup>2</sup> ) | Peak Buildup (g/m <sup>2</sup> ) | Conden-sation |
|-----------------------------------|--------------------|-------------------|-----------------------|----------------------|---------------------------------|----------------------------------|---------------|
| 1 Outside surface resistance      |                    |                   |                       |                      |                                 |                                  |               |
| 2 Beltermo Ultra                  | 3.2                | 0.8               | 0.65                  | 0.77                 |                                 |                                  | No            |
| 3 UdiTHERM                        | 8.7                | 1.1               | 0.66                  | 1.13                 |                                 |                                  | No            |
| 4 Ampatex Solero                  | 19.0               | 1.9               | 0.70                  | 2.19                 |                                 |                                  | No            |
| 5 Timber (500 kg/m <sup>3</sup> ) | 19.0               | 5.3               | 0.89                  | 2.19                 |                                 |                                  | No            |
| 6 Inside surface resistance       | 20.8               | 8.7               | 1.12                  | 2.45                 |                                 |                                  | 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 <sup>2</sup> ) | Peak Buildup (g/m <sup>2</sup> ) | Condensation |
|-----------------------------------|--------------------|-------------------|-----------------------|----------------------|---------------------------------|----------------------------------|--------------|
| 1 Outside surface resistance      |                    |                   |                       |                      |                                 |                                  |              |
| 2 Beltermo Ultra                  | 15.8               | 11.4              | 1.35                  | 1.80                 |                                 |                                  | No           |
| 3 UdiTHERM                        | 17.4               | 11.5              | 1.35                  | 1.99                 |                                 |                                  | No           |
| 4 Ampatex Solero                  | 20.4               | 11.6              | 1.37                  | 2.40                 |                                 |                                  | No           |
| 5 Timber (500 kg/m <sup>3</sup> ) | 20.4               | 12.5              | 1.44                  | 2.40                 |                                 |                                  | No           |
| 6 Inside surface resistance       | 20.9               | 13.4              | 1.54                  | 2.48                 |                                 |                                  | No           |

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

